All Around Us

SCOTT, FORESMAN AND COMPANY

TEACHERS EDITION

CURRICULUM

Ex libris
Universitatis
Albertaensis

UNIVERSITY OF ALBERTA
QUAECUMQUE VERA

Digitized by the Internet Archive
in 2016 with funding from
University of Alberta Libraries

https://archive.org/details/basicstudiesinscbeau_2

GUIDEBOOK for
All Around Us

Educ
Q
163
B37
gr.2
tch ed.

---

by Wilbur L. Beauchamp,
Gertrude Crampton,
and William S. Gray,
Reading Director

BASIC STUDIES IN SCIENCE
BOOK B

CURRICULUM FOUNDATION SERIES

SCOTT, FORESMAN AND COMPANY
CHICAGO · ATLANTA · DALLAS · NEW YORK

Contents

Introduction

Science in the Second Year of School 3
Areas of Interest 3
Use of the "Picture" Technique 4
Types of Pages 4-6
  The "Unit-Picture" Page 4
  The "Picture-Story" Page 5
  The "Generalizing" Page 5
  The "Pictured-Experiment" Page 6
  The "Application" Page 6
Skills Involved in *All Around Us* 6
The Lesson Plans 6
The Appendix 7

Unit 1: Animals

General Concepts 8
Introducing the Book 8
Lesson Plans 8-24

Unit 2: Getting Work Done

General Concepts 25
Lesson Plans 25-31

Unit 3: Sun, Wind, and Weather

General Concepts 32
Lesson Plans 32-40

Unit 4: Plants

General Concepts 41
Lesson Plans 41-51

Bibliography 52-57
Appendix 58-64

Copyright, 1951, by Scott, Foresman and Company
Previous Edition Copyright, 1944, by Scott, Foresman and Company

Printed in the United States of America

Philippines Copyright, 1951, by Scott, Foresman and Company

163
B37
g. 2

Introduction

Science in the Second Year of School

One of the chief duties of the school is to stimulate and guide the all-round growth of the pupil. A fundamental aim of an adequate science program is to stimulate and guide the pupil in a constantly growing understanding of the forces, elements, materials, and living things which, together, make up his everyday world.

There is an abundance of things to interest and challenge pupils—things to watch, things to investigate, things to do, and things to discuss. All the world lies before the child, to be explained and understood in its parts and, more important still, to be understood in the interrelationships of these parts. So great is the diversity, as well as the extent, of the natural environment that an organized plan of presentation is essential if the pupils are to grasp not merely facts but relationships as well.

A course in science must present information in an efficient manner. It must insure the mastery of basic understandings. But, to be really effective, it must also foster the intellectual skills and abilities necessary for scientific thinking: ability to observe accurately, ability to perceive likenesses and differences, ability to infer, ability to generalize, and ability to understand and use an oral science vocabulary. *All Around Us* and the *Teacher's Guidebook* have been carefully planned to promote the development of these skills.

A course in science may be considered successful only if it so affects the pupil that he maintains a true scientific attitude toward his total environment. Such an attitude leads to the development of accuracy in observation and report, intellectual honesty, open-mindedness, suspended judgment, and the ability to see relationships.

The purpose of *All Around Us* is to present examples from the environment that will lead the pupil to see relationships and help him organize his thinking. *All Around Us* is the second step in a program that helps the pupil to an understanding of the principles and laws of science.

Areas of Interest

In *All Around Us* four centers, or areas, of pupil interest—animals, getting work done, weather, and plants—provide a framework upon which the pupil organizes his knowledge and also provide a basis for further exploration. This broad plan of organization teaches systematic understandings rather than massed, unrelated factual information. (For a detailed list of concepts presented in *All Around Us*, see the Index to Concepts, pages 78-80.)

The scientific content of these broad centers of interest in *All Around Us* has been determined by three types of analysis:

1. An analysis of environment to determine the problems of living that are dependent upon science for intelligent solution.
2. An analysis of these problems to discover the principles and concepts of science which provide solutions, and to determine the age and grade level of the child at which these principles and concepts may be developed experientially and scientifically.
3. An analysis of these principles and concepts to provide the basic experiences upon which learning must be based.

Little of the actual content of *All Around Us* is new or strange to the pupils, and gaps in the pupils' background can usually be filled in quickly and efficiently. For example, few of the animals discussed in the first unit are animals that the pupils have not seen, talked about, or heard about in stories. Consequently, the basic subject matter is usually familiar; and the manner of viewing the subject matter, making inferences, and generalizing from it, provides the new element. The pupil is guided in the organization of his information through comparing things which he already knows about but which he has probably not considered in their relationship one to another. See pages 8-9. Almost every pupil is familiar with cats, dogs, rabbits, cows, pigs, elephants, lions, owls, deer, etc. In this lesson, however, he is asked to compare and contrast known animals with respect to color, size, markings, body covering, number of legs, presence of wings, etc. Thus the essential work of classification is begun with familiar examples, and the pupil is able to give his full attention to the fundamental skills of comparison, contrast, and analysis.

The teacher will find that the work of *All Around Us* has been arranged so that there are no lessons about *things* as such. If pupils are required merely to list what they see, their entire mental process is that of analysis for the purpose of discovering the characteristics of specific things pictured, with little regard to relationships. This process may at times be necessary, but description is never given the main emphasis, is never an end in itself.

The things pictured on the pages are to provide data to be used in the making of inferences and in the formulating of generalizations. The ideas to be gained by the study of the pictures are, of course, dependent upon the types of questions raised by the teacher. The concepts that are listed can be obtained only if the correct types of pupil activities are carried on.

Use of the "Picture" Technique

If time and available materials in the environment permitted, perhaps the best way to teach elementary science would be through first-hand experiences. Since this method of teaching is not always possible, the authors have used the second method (pictures) to expand the child's scientific interests and to satisfy his curiosities. By postponing the third method (reading of verbal text) until the child has a wide reading vocabulary, they have avoided either making a scientific book that is unreadable by many second-grade pupils, or making a book that is readable by second-graders but is a caricature of science.

The interpretation of the picture pages in *All Around Us* involves the ability to comprehend the ideas represented by the pictures, the ability to reflect on the essential facts or ideas presented, the ability to evaluate them critically in order to discover relationships between them, the ability to apply ideas gained from study and discussion of the pictures and from actual experimentation to the solution of problems, and finally the development of an oral meaning vocabulary to express ideas.

Types of Pages

Pupils who have had experience with picture books or who have used pre-reading materials or the first book of this Series, *Look and Learn*,* understand the symbolism of pictures. There are five types of picture pages used in *All Around Us*, with sufficient repetition of each type to establish in the pupil's mind a familiar pattern of procedure. Familiarity with procedure patterns allows the pupil to focus his attention upon science concepts without being confused or hampered by constantly changing methods of presentation.

The "Unit-Picture" page: At the beginning of each unit there is a full-page orientation picture, the purpose of which is to direct the pupils' thinking toward the general content of the unit and, at the same time, to give the teacher the opportunity to estimate each child's background, possible gaps in his experience and understanding, etc.

In presenting the first unit picture, *Animals*, the teacher should first read aloud the title. General examination of the picture with free discussion by the pupils should follow. The teacher is given a keen insight into the individual pupil's science background and oral vocabulary by such comments as: "You can tell this is going to be about animals—there are so many of them in the picture." "Look at the bear. I saw one something like that in the circus." "That black and white animal is a skunk." "I never saw a skunk." "See the squirrel." "That's not a squirrel. That's a chipmunk!"

This type of discussion also gives the teacher an opportunity to estimate in some detail the extent of the pupil's preparation and helps her decide which points need stress and development beyond that provided in *All Around Us* and in the *Teacher's Guidebook*.

---

* Scott, Foresman and Company.

When the teacher is sure that the pupils have a general idea of the picture as a whole, she should guide their thinking by asking such questions as: "Can we tell whether all the animals shown are baby animals? Why not? Are there any animals that you are quite sure are babies? Do you suppose any of these animals have their pictures in the first part of our book? Perhaps there are whole stories about some of them. Let us look through our book to see if we can find any of them." Through discussion the teacher should elicit from the children the distinguishing features by which each of the different animals could be recognized. The children's ability to describe and characterize should be carefully noted. (For a complete lesson plan see pages 8-9 of the *Teacher's Guidebook.*)

The "Picture-Story" Page: The picture-stories in *All Around Us* (see pages 4-5) are similar in general construction to those found in *Look and Learn.* The picture-story consists of several pictures, each of which represents an incident and all of which in sequence tell a story. The picture-story lesson often appears in *All Around Us* as a general introduction to concepts that will be more fully developed on subsequent pages.

After making sure that the pupils understand that this type of page is to be thought of as a story, the teacher should read aloud the title and encourage comments on it. Then pupils should be led to look at the group of pictures and to talk about them. Detailed analysis, need not, however, take place at this time. During the preliminary examination of the story, "The Fox Family," on pages 4-5, the pupils might discuss any experiences they have had or read about in connection with foxes. Then they should describe the place where the fox family of the picture-story lived, how many were in the family, etc.

Keeping the title in mind, the pupils should next analyze each picture in sequence, and the teacher should ask questions to bring out the information necessary for telling the story.

She might say, "This story is about a fox family. What is happening in the first picture? Why do you suppose the mother fox has lined the den with leaves? How do the baby foxes change as they grow up? In what ways does the father fox help in caring for the young ones?" (For a complete lesson plan see pages 9-10 of the *Teacher's Guidebook.*)

When each picture has been examined, the oral story should be told by the pupils. The complexity of the story reported will depend upon their maturity and background.

The teacher may find it advisable to direct the pupils' attention to science concepts brought out in the discussion. The picture-story lesson, thus, not only is pleasure-giving but also is an efficient means of presenting the concepts to be discussed in the pages that follow. The picture-story of pages 4-5, for example, introduces concepts to be found in the remainder of the unit.

The "Generalizing" Page: In the field of science great strides may be made in developing habits of analytical thinking, for the objectivity of science stimulates mental attitudes and skills that are greatly to be desired.

Several types of generalizing pages are used in *All Around Us.* The small pictures on these pages are arranged in varied patterns. The pattern of pages such as 7 and 64 forces the recognition of likenesses and differences; the pattern of pages such as 12 and 68-69 forces the recognition of the sequential order of development; the pattern of a page such as 25 forces recognition of a main idea by many examples; and the pattern of pages such as 52-53 forces the making of inferences. Whatever the pattern, if the data are accurately observed and the small pictures compared with each other, the pupils will see the relationships involved and derive for themselves basic science principles and generalizations.

When introducing these pages, the teacher should first read aloud the title, if one is used, and should explain to the pupils exactly what they are to do. If, for example, they are to make simple comparisons, they should understand the procedure thoroughly. This will eliminate hit-or-miss examination of pictures. Free discussion, which in the case of the picture-story *precedes* the formulation of the story, usually *follows* the work in the generalizing page. With this type of page, attention should be centered upon the problem to be solved and the technique of solving it. The preliminary work may include identification of the animals, plants, or objects pictured and a demonstration of the procedure to be followed. It is preferable to study each problem separately rather than ask the pupils to consider the page as a whole. The immediate follow-up work should include justification of answers and further discussion of the problem in order to relate it to the pupils' own experiences.

The "Pictured-Experiment" Page: Experimentation is introduced at this level, and care should be exercised by the teacher when presenting the technique. The problems and procedures are simple, and often the results are indicated. Experimentation should not be confused with hit-or-miss activity. Pupils should perceive that experimentation is an orderly way of solving a problem. The problem is posed, the experimenter makes sure he understands the problem, the materials are listed and assembled, and the procedure is shown for the experimenter to follow. He then notes his results and solves the problem by interpreting them. Obviously, experimentation involves many skills and attitudes necessary not only in science but in all life situations. The teacher will find that the lesson plans develop experimentation techniques with great care.

The "Application" Page: After concepts have been developed, summary or application pages are provided. For example, page 14 checks the pupil's ability to apply the concepts taught on pages 10, 11, 12, and 13. Pages 26-27 and 38-39 provide opportunity to apply the concepts developed throughout the entire unit.

These application pages are important since they permit the teacher not only to estimate frequently the pupil's understanding of basic concepts and to rectify quickly any errors in understanding but also to reassemble the concepts already presented into larger units and assist the child in perceiving broader relationships.

Skills Involved in *All Around Us*

The development of science concepts is quite properly a matter of great concern to the authors of elementary science books. However, a science program, to be of real and full value, must also develop desirable habits of accurate thinking. Consequently, definite skills and abilities which lead to accurate thinking must be developed in the science program.

The pictures, titles, and subtitles of *All Around Us*, combined with the teaching procedures recommended, develop the following major skills:

1. Observing characteristics (Plants have different parts.)
2. Observing and comparing characteristics Different kinds of birds have different kinds of feet, feathers, bills, etc.)
3. Observing the habits of living creatures (Animals care for their young in various ways.)
4. Observing changes in time or place (Shadows are in different places at different times of the day.)
5. Observing a series of specific cases to arrive at a concept of class (Living things are distinguished from non-living things by certain characteristics.)
6. Discovering conditions responsible for certain effects (Rise in temperature causes snow to melt.)
7. Inferring effects that follow certain conditions (Green plants excluded from light will not grow to maturity.)
8. Classifying according to a given criterion (Wind may be a helper or an enemy.)
9. Organizing events into a sequence (The children trace the stages of growth in animals.)
10. Making generalizations (Mammals have certain common characteristics.)
11. Applying generalizations (After proving experimentally that plants need light, the child is able to tell what will happen to grass covered with a plank.)
12. Making inferences (When wind bends young corn but not treetops, it is not very strong.)
13. Inferring relationships from data (The children are led to see the type of activities that are to be carried on at a given temperature.)

The Lesson Plans

Because *All Around Us* is a non-reading book, the science concepts and the science skills which are fully and carefully planned for each lesson may not be obvious. For this reason the *Teacher's Guidebook* has been bound with *All Around Us* to facilitate the presentation of each lesson. The lesson plans provided in the *Teacher's Guidebook* are divided into the following sections:

1. **Relation to the Unit**—a statement of the part which the lesson plays in developing desirable major science principles or concepts, and of the value of the lesson in building certain desirable skills.

2. **Concepts**—a list of the major ideas embodied in the lesson.

3. **Information for the Teacher**—facts which will help in answering certain questions that may arise; also suggested preparation for the lessons, including possible demonstrations, experiments, observations, etc.

4. **Procedure**—suggested methods for developing the concepts through interpretation of pictures.

5. **Extending and Enriching Activities**—suggestions for extending and enriching the pupils' understanding and for applying concepts to the solution of new problems.

Many activities are suggested in the *Teacher's Guidebook.* Additional activities planned by pupils and teacher will prove valuable, especially those involving local situations. Many activities may be undertaken independently by individuals or groups, and reported in the science period. Every effort should be made to allow for full experience not only in using *All Around Us* but also in carrying out the related activities. The extent of the pupil's science understanding will depend upon the use he makes of *All Around Us* to interpret his own environment and experiences.

The Appendix

This section of the *Guidebook* presents detailed directions for providing equipment, materials, and experiences that will promote learning through observing, handling, and experimenting. Such experiences develop the habit of independent inquiry, which is as valuable as exact information.

UNIT 1 Animals

General Concepts

A. Animals may be classified into groups according to their general physical characteristics.
B. Animals follow a definite pattern of growth.
C. Animals must have food to live and grow.
D. Baby animals receive varying degrees of parental care and protection.

(For a more detailed outline, see Index to Concepts, pages 78-80 of *All Around Us.*)

Introducing the Book

All Around Us should be presented as an interesting and unusual picture book. Display the book and discuss the meaning of the title with the children. Then say, "What did you see on your way to school this morning? Tell us one thing." After several pupils have mentioned something they saw, turn to a page in *All Around Us* which shows something mentioned by one pupil and say, "On this page I see something that Mary said that she saw on her way to school. Who would like to come up and point to it? Would you like to look for a picture of something you saw?" Distribute copies of the book to the pupils and allow them to make comments about the cover. As they open the book, direct attention to the title page by comments such as, "The name of this book is *All Around Us.* When we study the pictures in the book, we will learn much that is new and interesting about things all around us like the baby birds at the top of this page." Let the pupils glance through the book, locating and commenting upon pictures of things they saw on their way to school and about which they would like to learn.

Note: At this time the teacher should consult the Appendix of this *Guidebook* for suggestions on providing first-hand experiences with plants and animals. The collection of insects and small mammals should be started now, so that facts gained from the study of the book may be implemented by knowledge gained from observation of the habits of animals over a long period.

Page 3

Relation to the Unit: To introduce the unit's center of interest; to provide the teacher with an opportunity to explore the children's background in this area.

Procedure: Chapter title pages should be used by the teacher to arouse the children's interest in the unit to be studied, to estimate informally the scope of the children's knowledge in the general science area, and to assist in uncovering gaps in understanding that need to be considered in subsequent teaching procedures. The children, of course, should not be aware of these latter aims.

There are many ways in which page 3 might be presented, and much of the discussion depends upon the interest and background of the class. After the book itself has been introduced, the page might be presented and developed somewhat along the following lines.

Show the children page 3 and have them find it in their books. Say, "This page tells us what the first part of our book is about. What do you see on this page?" Notice how many of the animals—bluejays, raccoon, bear, skunk, chipmunk, fox, butterfly, and beetle—are correctly named, and then give help with any unfamiliar animal names. "Have you ever seen any of these animals? Tell us about them." Encourage discussion drawn from the children's actual experience. "What is a good name for all of these?" Elicit the generic term *animals.* "What will the first part of our new book be about? Let's glance quickly through the pages to see whether we are right."

Say, "Turn back to page 3. Can we tell whether all the animals shown are baby animals? Why not?" Elicit that one common way to tell whether these are baby animals would be to compare them with full-grown adults. Children should comprehend that one characteristic of immaturity is usually comparative smallness in size. This is not always true, of course. "Are there any animals that you are quite sure are babies?" Note whether the pupils point out the inadequate wing and tail structure of the bluejays, the lard pail as a rough device for estimating the size of the cub, and the relative sizes of the toadstool and the chipmunk, the butterfly and the fox. After noting the responses, give whatever help is needed. Determine whether, after children note the size of the cub, the chipmunk, and the fox, they have in mind rough approximations of the size of the adults.

"Do you suppose any of these animals have their pictures in the first part of our book? Perhaps there are whole stories about some of them. Before we ask (name of child) to find out whether the bluejay is shown on other pages, let's decide just how he will make sure whether the animals he sees are bluejays. First of all, of course, he should be sure he is looking at a bird!" Elicit some general information about the characteristics of birds. Too detailed analysis should not be required, but responses should indicate the extent of the children's understanding of the term *bird.* "When (name of child) is looking at a bird, how will he know whether it is a bluejay or not?" Notice whether the children merely state the main color of the bird or include such items as wing marking, breast color, shape of head and bill, etc. It is not expected that the children will name all the distinguishing features that might be used, but the children's ability to describe and characterize should be noted.

Continue in the same way with the remaining animals, having various children search through Unit I to determine whether the animals appear in the subsequent lessons. Probably the pupils will include the moths on pages 13-14 in their search for butterflies. No issue should be made of the matter at this time, but say, "These really are not butterflies. They are moths. Moths look much like butterflies, though there are differences. When we study page 13, we shall talk about the differences between moths and butterflies."

Description of each animal should precede the search, and careful notations should be made of the completeness of the descriptions: whether descriptions are confined to color and markings, whether they include reference to general shape and structure, and whether they include detailed analysis. It is also advisable to give close attention to the children who search for the various animals. The confidence with which the child undertakes the task, the method he uses (whether he leafs through at random or begins at page 4 and progresses methodically; whether he readily recognizes the end of the animal unit or continues far into subsequent units; whether he examines each page with unnecessary care, glances too casually at each page, or uses good judgment in his time allotment to a page), the completeness of his search, and the scope and language of his report are all helpful in evaluating the child's development.

Conclude the lesson by saying, "We shall learn many things about some of the animals on this page. I think we shall learn about other animals, too. Next time we are going to have a story about some animals just like one of the animals on this page."

Pages 4-5

Relation to the Unit: To introduce in story form major concepts of the unit.

Concepts: Animals follow a definite pattern of growth; animals must have food to live and grow; some baby animals get parental care and protection.

Information for the Teacher: The fox litter, which may number as many as nine, is born around the first of April. The cubs are kittenlike in appearance and are covered with soft, fine, short hair. Their eyes remain closed until the eighth or ninth day, and the cubs stay in the den from three to four weeks. When the babies are about three months old, they are weaned; however, they eat some solid food before this. By the end of August they are fullgrown. Then they scatter, each fox to establish a den of its own.

The teacher will note in this lesson, as well as in subsequent lessons of the same type, that not all the young animals are shown in each picture. This is done to permit the drawing of larger illustrations.

During the lesson develop the meaning of such words as *litter*, *den*, *scent*, *tracking*, *shelter*, etc.

Procedure: Before passing out the books, display pages 4 and 5, read the title "The Fox Family," and explain that the eight pictures show how a hungry family was fed. Tell the pupils that the pictures on each page are to be read in the same way as the "funnies." Indicate the order of progression on page 4 and then on page 5.

After the books have been distributed, allow the pupils to scan the pictures and make comments freely about each one before beginning a systematic study of the two pages.

Direct the pupils to look at the first picture. Then ask, "Where is the foxes' den?" Lead them to notice that the den is the hollow trunk of a fallen tree. "What did the mother use to line the nest? Why do the babies need care?" Through discussion bring out the fact that their eyes are not open, their legs are wobbly, and their fur is short. "What kind of food do they get? What else does the mother do for the babies besides feed them?"

Continue by saying, "Look at the next picture. How can you tell that time has gone by?" The pupils should include in their responses that the babies are larger and stronger, their eyes are open, their fur has grown longer, and they look much more like their mother than they did before. "Do they now eat the same kind of food as their parents?"

In the discussion of the third picture point out that the young foxes are old enough to go outside the den. Then ask, "How do the babies spend much of their time? How is this playing good for the babies?" Elicit that the exercise develops their muscles and teaches them how to use their teeth.

"In the fourth picture the babies are not shown. They are in the den. They are now so old that they no longer drink milk. They eat the same sort of food that the parents do. Where do you think the father is going? Why doesn't the mother go with him? What dangers may the father meet?"

Ask, "What is happening in the fifth picture? If the father got out of sight, do you think the dogs could still follow him? How? Have you ever been followed by a dog who smelled your footsteps?" Encourage the pupils to tell of their experiences with animals which tracked them.

"What is the fox doing in the sixth picture? Can the dogs follow his tracks now?" If the children are unable to answer, tell them that the fox breaks his tracks by jumping across the water.

"What do the dogs do when they reach the place where the wise fox leaped to the rocks? Do you think they will be able to track him farther?" Be sure the pupils understand that the dogs will lose the scent at this point, and the fox will escape.

"What did the fox catch that day? What did he do with it?" Explain to the pupils that, while foxes do occasionally steal hens, they do so only because they need food. They repay the farmer in part by the great number of mice and rats they kill.

Narrative Interpretation: Say to the pupils, "Now we are ready to tell the story. How would you begin it?" Have different pupils discuss each picture. Use guiding questions or comments to direct the narrative so that it includes much descriptive detail.

Extending and Enriching Activities:

1. The pupils should begin to make collections of animal pictures, particularly of young animals. As far as possible, pictures in color should be selected and should be individually mounted so that they can be used for various types of study and discussion.* (See Appendix, page 61)
2. The pupils may list and discuss other animals that they know which, like the fox, are born, fed mother's milk, and sheltered from harm.
3. Discuss other animal homes, using such terms as *den*, *cave*, *nest*, *burrow*, etc. The function of the home as a shelter should be stressed.

Page 6

Relation to the Unit: To promote the concept that animals may be classified into groups according to general physical characteristics.

Concepts:

A. Birds have bodies covered with feathers.
B. They have two legs and two wings.

Information for the Teacher: The pupils have already learned in *Look and Learn* that animals can be distinguished by physical characteristics and that these characteristics are used as a basis for classification. The idea of using characteristics as a basis for differentiation is reviewed at this point because the techniques of comparing and contrasting are necessary to derive the concepts that are developed throughout the unit.

---

* If the class started a collection of this nature in Grade 1, it may be borrowed and extended.

In addition to the characteristics listed above, birds have no teeth, they are warm-blooded, and they breathe with lungs. These characteristics, however, are not brought out at this level.

The names of the animals used in the lesson are cardinal, hen, mourning dove, chipmunk; black panther, eagle, parrot, goose; bluejay, duck, lamb, sparrow. The pupils are not expected to learn or use the names unless they are familiar. When the names are known, or when the pupils themselves evince interest in them, it is highly desirable to use them.

In the discussion review the meaning of such words as *bills*, *wings*, *feathers*, *beak*, etc.

Procedure: Direct attention to the first row of animals and say, "Which three animals in this row are most alike? In what ways are they alike?" The children should include in their responses such things as the number of legs, the wings, the feather body covering, the bills, etc. Ask, "In what ways is the other animal different?"

Continue in the same manner with all the rows, having the pupils point out the similarities and differences.

After comparing the animals in all the rows, say, "What has the artist painted in the colored bands? Are all the feathers the same size and shape? Where on a bird do you find the big feathers? Where do you find the little soft feathers?" Encourage the pupils to describe various kinds of feathers that they have seen.

At the close of the discussion say, "In what ways are all the animals except three on this page alike?" Help the pupils make the generalization that all birds have bodies covered with feathers, have two legs, and two wings.

Extending and Enriching Activities:

1. The pupils will derive enjoyment from making a feather collection which may be displayed on the classroom bulletin board.
2. Add bird pictures to the animal collection. These bird pictures may be used to supplement the discussion if the teacher desires to present additional examples of birds.
3. As generalizations are made on this and succeeding lessons, the pupils should be encouraged to play charades and guessing games and to work puzzles that will help to drive home the generalizations.
4. Take the children on a field trip and have them compare and contrast the birds and animals they see.

Page 7

Relation to the Unit: To extend the concept of animal classification developed on page 6.

Concepts:

A. Insects have six legs.
B. They have two feelers, or antennae.

Information for the Teacher: Other characteristics of insects are that they have a hard body covering and that their bodies are divided into three parts. Unless activity 3 of this lesson plan is carried out, neither of these characteristics should be brought out at this level.

If the children know that some kinds of ants have wings, though the one in the picture has none, include that fact as an item of similarity in discussing the ant. All the insects on this page except the ant have wings, as do the *majority* of insects, but the teacher should be careful not to set up the idea that all insects have wings.

Spiders are often erroneously called insects. In discussing the last row, have the pupils note the eight legs, which make the spider different from the insects. If children ask what spiders, centipedes, and frogs are called, they are arachnids, myriapods, and amphibians.

The names of the animals used in this lesson are ant, bee, tree frog, fly; grasshopper, mosquito, firefly, centipede; cricket, spider, dragonfly, wasp.

In the discussion develop such words as *insects*, *body*, *antennae*, *feelers*, *parts*, *centipede*, *marking*, etc.

Procedure: Direct attention to the first row of animals and have the pupils identify them. Encourage the pupils to tell what they know about each. Ask, "How is the ant's body different from the tree frog's body?" Elicit that the ant has six legs. Then ask, "What does it have on its head that the tree frog does not have?" Lead the pupils to notice that it has "feelers," or "antennae." Ask the pupils if they have ever seen feelers on any other animals and what the animals seemed to be doing with them. (Antennae are organs of sensation, chiefly of touch.) Now direct the children to look at all the animals in this row and ask, "Which three are most alike? In what ways are they alike?" The pupils' responses should include the facts that the ant, the bee, and the fly all have six legs and that they have antennae on their heads. Then ask, "Which two are alike in another way?" Lead the pupils to say that the bee and the fly have wings. "What general name could be given to the three animals in this row that are most alike?" If the children answer "bug," supply the correct word, "insect," for them.

Continue with all the rows, having the pupils point out similarities and differences.

After a discussion of the likenesses and differences of the animals in each row, have the pupils compare all the animals on the page. To lead the class to make the generalization that all of them but the spider, the centipede, and the tree frog are insects, ask the questions, "What animals on the page are not insects? Why not?"

At the close of the discussion period, have the children tell what the artist has drawn in the colored panels on the page and then say, "Which insect on this page has no wings? Some insects do not have wings. Which insects on this page do have wings? Many insects have wings. How do the wings of insects differ from those of birds?" Elicit that they are thin, transparent, and unfeathered.

Extending and Enriching Activities:

1. Make a collection of insect specimens if the children's interest and the season warrant. (See Appendix, page 61.)
2. Whether or not a large insect collection is to be made, some specimens should be brought into the classroom. Compare the wing structure with that of a bird, note the leg construction, etc.
3. With actual specimens before the class, elicit that insects have a third characteristic not previously discussed; namely, bodies divided into three parts. After several specimens have been examined to verify this generalization, the pupils should reëxamine page 7 and find similar body divisions. In some cases, of course, the three-part division is not obvious because of the wings.

Pages 8-9

Relation to the Unit: To review the concept presented in *Look and Learn* that most baby animals resemble their parents more closely than they resemble other animals.

Concepts:

A. Baby animals are smaller than their parents.
B. Baby animals may differ in color and markings.
C. Baby animals may differ in minor structural details.
D. Baby animals usually resemble their parents in gross structure.

Information for the Teacher: The animals pictured on page 8 are cats, kittens, rabbits, puppies; puppies, raccoons, chipmunks, dogs; deer, mountain lion cub, fawn, kid; chicks, chickens, goslings, owlets.

Those shown on page 9 are elephants, rhinoceros, giraffe, baby elephant (calf); lion cubs, monkey, zebra, lions; hogs, fox, wolf, pigs; horses, panda, colt, calf.

Procedure: Direct attention to the animals in the top row on page 8 and say, "Are all these animals alike? How are they different? Are they all the same size—the same color—the same shape? Do they all have the same kind of ears—eyes—tails? Two of the animals in this row are grown-ups. Can you find them? How do you know? Which animals in this row are their babies? How can you tell? In what ways are the babies like their parents? Do the babies and the parents look exactly alike? How are they different? How did you know the puppies and the baby rabbits did not belong to the mother and father cats?" If the pupils merely respond that cats do not have puppies or rabbits, direct their attention again to physical differences between the cats and the other animals in the row. Make sure that pupils note such details as the shape of the ears as well as gross body structure and coloring.

Continue in the same manner with the other rows on pages 8 and 9. In row 2 on page 8 lead the pupils to notice that the babies are identical to the parents in color and marking; whereas the kittens were similar but not identical. In rows 3 and 4, page 8, and rows 1 and 2, page 9, note that the differences are those of minor structural details (for example, spots, antlers, combs, spurs, different type of feathers, tusks, mane, tails). The children should notice that the puppies, baby pigs, and colt are almost exactly like their parents.

To strengthen the generalization that baby animals resemble their parents more closely than they do other animals, ask, "In the first row, page 8, in what ways are the kittens most like their parents?" Continue in the same manner with the other rows on pages 8 and 9.

Extending and Enriching Activities:

1. To review the important skill of comparing and contrasting physical characteristics of animals the teacher may ask, "Find all the animals on pages 8 and 9 that have two legs—four legs—long legs—webbed feet. Which animals have bodies covered with fur—feathers? Which have spots—stripes? How many have long ears—long tails—bills, etc.?"
2. Pictures of three or four mature animals may be shown along with one baby animal. The pupils should select the parent of the baby animal and justify their choice.

Page 10

Relation to the Unit: To present stages in the growth of a mammal from birth to maturity; to present certain common distinguishing characteristics of mammals.

Concepts:

A. Mammals are born.
B. Baby mammals get milk from the mother's body.
C. Mammals have hair on their bodies.
D. Mammals at birth resemble their parents.
E. Baby mammals increase in size until maturity.
F. As mammals grow, they change in ability to do things.

Information for the Teacher: The young in the first small picture are newly born; in the second, about three weeks old; in the third, about four months; and in the last, six months. At this time they are fully grown, although they may stay with their mother until they are a year old.

If desired, tell the pupils that skunks are born just as kittens and puppies are. It is satisfactory if children give "born" the connotation common at this level: that they can see the actual animal rather than merely the egg; that it is a recognizable living entity similar to the parent; that it eats in the sense that the child understands eating—in this case by drinking milk from the mother's body. A skunk is weaned at two months.

During the discussion develop such words as *born*, *nurse*, *solid food*, *strong*, *mammals*, etc.

Procedure: Have the pupils identify the animal at the top of the page and tell anything that they know about skunks. Then direct them to study the first picture below. Say, "In what ways are the baby skunks like their mother? Are they the same shape? Are their bodies marked the same? How are they different? Are they the same size—the same color? Do they have tails and fur like their mother?" Lead the pupils to see that the pink color of the newly born skunk is due to the fact that it is nearly hairless. Then ask, "Do you think that the baby skunks could take care of themselves? Why not?" Make sure that the pupils note that the babies are almost helpless, for their eyes are closed, their legs are unsteady, and they have no protection from the cold. "What kind of food do these babies get? Why do they need food?"

After the pupils have studied the second small picture, ask, "How can you tell that time has gone by?" Pupil responses should include the ideas that the babies look larger and more like their mother, although their fur is still not as long and fluffy as hers. "Do you think they still need their mother? Why? In the next picture are the skunks older? Why do you think so? In what ways do they look more like their mother now? What do you think they might be looking for? (food) In the last picture the skunks are fully grown. What do you think they can do for themselves now?" Through discussion bring out the fact that, because skunks feed on insects and rodents that are injurious to crops, they should not be killed.

In order to summarize for the class the progressive changes in size and independence of the babies, say, "Tell us how skunks grow and develop." Assist children to tell how the skunks look and what they can do at birth, at three weeks, at four months, and at maturity. To help the children make the generalization that animals with certain common distinguishing characteristics are mammals, have the pupils turn to page 4 and tell in what ways the baby skunks and baby foxes are alike. As they give the likenesses (they are born, drink milk from the mother's body, have hair), list them on the board. Conclude the lesson by saying, "We call animals about whom we can say these things *mammals.*"

Extending and Enriching Activities:

1. If regulations permit, bring a pair of white mice or rats to the classroom and keep them in a place convenient for observation.
2. Reëxamine pages 8-9 and decide whether the parents and their young in each row are mammals. Since the young are not shown feeding, the teacher should give prompt help when it is needed.
3. Classify the animals in the picture collection on the basis of whether or not they are mammals.
4. Begin making a large chart, using both pictures and simple text, which can be added to as the work progresses, of various animal groups and their characteristics. At this stage the children have learned, and the chart might depict, the following:

ANIMALS

Mammals	*Birds*
Mammals are born.	Birds have feathers.
Mammals nurse.	Birds have two wings.
Mammals have hair.	Birds have two legs.

Insects

Insects have six legs.
Insects have two feelers, or antennae.
Insects often have wings.

Additional information should be added as it is developed in future lessons.

Page 11

Relation to the Unit: To present stages in the growth of a bird (the scarlet tanager) from egg to maturity.

Concepts:

A. Birds hatch from eggs.
B. Birds increase in size until maturity is reached.
C. Baby birds vary in color and texture of plumage from the parents but resemble them at maturity.
D. Frequently male and female birds differ in plumage.
E. As birds develop, their ability to do things changes.

Information for the Teacher: The scarlet tanager, which breeds in the eastern part of both Canada and the United States, has been called "the guardian of the oaks," since its food is largely animal matter—moths, beetles, caterpillars, ants, and grasshoppers, all of which are often injurious to trees.

The male tanager passes through an interesting sequence of plumage changes. In the nesting period the plumage of the male and the female is alike. The next fall the male is yellower and has browner wings than the female. In this dress the male goes to South America for the winter, during which time he acquires a pale red body and a black tail, but retains the brownish wings. In this garb he comes north again, mates, and rears his young. Following the nesting season he molts, and the new plumage is yellowish green with black wings. When he again goes south, he looks much like the female. During the second winter he becomes a deep scarlet with black wings and tail, the characteristic coloring of the adult male tanager. Twice a year thereafter the body color is changed—from scarlet to yellowish green in the north, and from yellowish green to scarlet in the south.

In the discussion develop such words as *tanager, male, female, coloring, plumage* (optional), etc.

Procedure: Direct attention to the picture at the top of the page. Ask, "Have you ever seen a bird like this one? Do you know its name?" If the children are unable to answer, tell them that it is a scarlet tanager and explain that this one is the male, or father. Then have them look at the picture in the lower right-hand corner. Say, "Here we see both the father and the mother scarlet tanager. How is the coloring of the mother different from that of the father? Do you know any other kind of bird in which the male and female have different coloring?"

"Look at the first small picture. How many eggs do you see in the nest? What color are they?" Have the children note the loose construction of the nest, which merely rests upon a fork in the branches, and talk about the way in which birds make nests.

"How many baby birds do you see in the second small picture? Where did they come from? In what ways do they look like their parents? How are they different? Do you think these little birds could fly? Why not?" The children should notice the half-naked bodies of the day-old birds and their lack of strength. Ask, "Why do you suppose they are looking outward and one has his mouth open? Where do you think the parents are?"

Tell the pupils that the little birds in the third picture are from two to three weeks old. Lead the children to see the changes that have taken place in the little birds' plumage, in their ability to get around, and in the appearance of the eyes. Then compare the babies with the adults in the last picture, bringing out the fact that the babies do not have well-developed wings or tails, and thus are unable to fly. Contrast their coloring with that of the adult birds and explain that the female birds, when full-grown, will resemble the mother and the male birds will resemble the father. Conclude the lesson by asking, "How is the development of a bird different from that of a skunk? How is it alike?"

Extending and Enriching Activities:

1. Put up a birdhouse in the schoolyard, if possible, so that the children may actually observe the growth of young birds.
2. Make a big chart and, as the pupils report seeing some bird native to the community, mount a picture of that bird.
3. Add information to the large animal chart begun in the previous lesson.
4. List things that the baby birds can do when they are mature. Such a list might include: they fly; they find their own food; they make nests. Discuss other animals and stress the fact that reaching maturity implies more than completing physical growth.
5. Have the pupils list skills and abilities that develop in human beings, such as being able to walk, learning to read and write, being able to feed oneself, bathe oneself, balance on skates and bicycles, earn money, support a family, etc. Have the pupils name the things that they can do but babies cannot do; have them name the things that they can do now but could not do in kindergarten.

Page 12

Relation to the Unit: To present the stages in the growth of a frog from egg to maturity.

Concepts:

A. Frogs hatch from eggs.
B. Frogs do not resemble their parents when hatched but do resemble them at maturity.
C. Frogs pass through a series of structural changes before maturity is reached.
D. As frogs develop, their ability to do things changes.

Information for the Teacher: The mother frog deposits her eggs, often as many as 6000, on a water plant; and, as the jellylike substance with which the eggs are surrounded swells, it glues or fastens the mass to the plant.

Children often confuse frogs and toads, but they can be distinguished in the following ways: the frog's skin is smooth and moist, while the toad's is rough and dry; the frog's color is more often green, the toad's brownish; the frog's face is more pointed than the toad's.

In the discussion develop such words as *mass*, *gills*, *tadpole* (or *polliwog*), *jellylike*, etc.

Procedure: Display the picture of the leopard frog and ask the children if they have ever seen a frog. Encourage them to talk of their experiences in connection with frogs. Tell the pupils that this frog is called a leopard frog, and that, as it grew from an egg, the shape of its body changed many times. These changes were so varied that the frog seemed almost to change from one kind of animal to another. Although mention should not be made of gills as contrasted with lungs, the children should understand that the initial stages of the animal's growth take place in water, and it is not until the tadpole develops a recognizable frog-structure that it can live partly on land.

Tell the pupils, or elicit, that from February to May, depending upon the region, the female frog lays her eggs, which stick together, forming a sort of jellylike mass. Explain that the first picture in the lower section of the page shows the top side of one of the eggs greatly magnified. (In reality the brown spot is only about the size of the head of a common pin.) Then direct the children to follow the arrow around. Say, "The second picture shows the egg when it is a week old. How has it changed?"

Be sure they note the development of the young animal within the egg and lead them to see that the shape of the young tadpole is clearly visible.

Explain that in the third picture the tadpole has hatched and that it has grown large and strong enough to wiggle away from the mass of jelly. Ask if they know what the red fringes are. If no one knows, tell the pupils that these are the gills through which the tadpole breathes in the water. "Can you see the gills in the second picture, which shows the tadpole before it is hatched? Do you know any other animals that breathe with gills?" (Fishes.) "Where do animals that breathe with gills live?"

Have the children follow the sequence of pictures, tracing the changes as the tadpole develops. Draw attention to the appearance of hind legs in the fifth picture. Tell the children that the front legs come out one at a time. Make sure they understand in the last two pictures that the tail does not drop off but is absorbed in such a manner that it gradually disappears, to vanish completely by the time the frog is about one and a half inches long.

Ask, "Does anyone know what happens to a frog's skin while the frog is growing?" If responses are vague, tell the pupils that the skin is shed five or six times a year, slitting down the middle of the back and the under side and down the tops of the four legs.

In summarizing the development of the frog, emphasize the egg, the tadpole (which is the first baby animal presented in this unit that after hatching really looks like a different kind of animal), and the adult. Pupils should understand that it takes about fourteen weeks for the egg to develop into a frog like the one at the end of the sequence of pictures. Ask, "Where does this animal live when it is still in the egg and when it is a tadpole? (in the water) Where does it live when it has become a full grown frog?" (largely on land since it now has lungs and can breathe air) Recall the lessons on the skunk and the bird. Have the children compare the development of the frog with that of the skunk and the bird, noting likenesses and differences.

Extending and Enriching Activities:

1. Hatch some frog eggs. If possible, collect the eggs on a field trip. Frog eggs are better for an aquarium than toad eggs and may be easily distinguished because they are larger and are laid in masses instead of in strings. Bring several masses of frog eggs to the schoolroom and keep them in an aquarium where there are no other animals. Watch their development from day to day so that the children can actually see the stages in the development of a frog from egg to maturity.
2. Elicit, or point out, that a toad is very similar to a frog and follows the same structural changes in its development.

   Discuss and compare the length of time it takes for (a) a mature frog to develop from the egg, (b) a mature bird (tanager or other bird) to develop from the egg, (c) a mature mammal (skunk or fox) to develop from birth, and (d) an adult human being to develop from birth.
3. Name the things a frog can do that a tadpole cannot do; the things a tadpole can do that a frog cannot do.

Page 13

Relation to the Unit: To present the stages in the growth of a moth from egg to maturity.

Concepts:

A. Moths hatch from eggs.

B. Moths do not resemble their parents when hatched but do resemble them at maturity.

C. Moths pass through a series of structural changes before maturity is reached.

Information for the Teacher: A moth may be distinguished from a butterfly in several ways. A butterfly is active during the day; a moth, during the night. The antennae of the moth are branched and have no knobs at the tips. Those of the butterfly are smooth and have knobbed ends. The butterfly's wings, when at rest, are held upright over the insect's back; those of the moth, folded. The development of the *cecropia* moth from egg to adult takes approximately a year, the longest growth cycle presented so far.

In the discussion develop and review such words as *antennae*, *feathery* (as applied to a moth's antennae), *caterpillar*, *cocoon*, *spins*, *thread*, *development*, etc.

Procedure: Show the children the picture of the moth at the top of the page and ask them whether they have ever seen one and whether they know its name. They may call it a butterfly. If so, give them the correct name, *moth* (Cecropia), and ask whether they have noticed or heard of any other moths. Direct their attention to the antennae and three body parts; tell them that moths have six legs. Say, "On page 7 we studied other animals like the moth. What general name did we give to them? What kind of animal do you think this one is?"

Tell the pupils that the female moth lays many eggs, sometimes as many as several dozen, on one leaf. Direct the children to follow the arrow around as they did in the frog series. Then ask, "What do you see on the leaf? What hatches from each moth egg?" If the pupils respond that a worm does, tell them that we call it a caterpillar, not a worm. Ask, "In what way is it like a worm? What happens to your skin as you grow?" Explain that the caterpillar does not have a skin that grows bigger as the animal grows, and ask, "Can you guess what happens when the caterpillar gets too big for its skin?" Have the pupils point out the picture that shows the caterpillar shedding its skin. Then say, "What other animal have we talked about that also sheds its skin as it grows?"

Ask, "What do you think the caterpillar is doing in the fifth picture?" Tell the pupils that the caterpillar spins a cocoon after it sheds its skin for the fourth time. "Where do you think it gets the thread for its cocoon?" Tell them that the caterpillar makes the thread in its body and that the thread comes out of its mouth. Tell them also that this thread, when it is first spun, is soft, but that it soon hardens in the air.

Direct the pupils to look at the sixth picture; then ask, "Where is the caterpillar?"

Draw attention in the seventh picture to the moth emerging from the cocoon. (Moths usually emerge in late May or early June.) Tell the children that the moth is full-grown as far as size is concerned, but that it is weak when it first emerges. After an hour or so in the air, the wings dry and the moth is strong enough to begin its adult life. Tell the children that grown-up moths are entirely harmless, since they never eat anything and live but a few days.

In summarizing the growth of the moth, emphasize the four stages of its development—egg, caterpillar, cocoon, and adult. Have the pupils compare this with the stages in the development of the frog. Ask, "How does the development of the moth differ from that of the frog? In what way is it like the development of the frog? How does it differ from the development of the skunk and the tanager?"

Extending and Enriching Activities:

1. Find a young caterpillar and bring it to the classroom so that the children may feed it.
2. Bring a cocoon into the classroom in the fall (cocoons are often found hanging to twigs of trees or lying among fallen leaves) and keep it carefully sheltered in sphagnum moss during the winter. Open the cocoon after the moth has emerged and note the papery outer covering, the loosely woven silk, and the inner shell.
3. If the season permits, bring insect eggs into the classroom. Otherwise, bring in pictures of insect eggs. Compare these with the eggs of birds, particularly with regard to size and outer coating.
4. Explain that, while all insects do not pass through the same stages as does the moth, they do undergo structural changes in developing from the egg to the adult stages. Using examples available in the locality, trace the development of several insects.
5. Add to the animal chart.

Page 14

Relation to the Unit: To determine the pupils' ability to apply concepts regarding the sequential nature of growth.

Information for the Teacher: Although toads pass through exactly the same cycle as frogs, toad eggs are black and are laid in strings; whereas frog eggs are black and white and are laid in masses. Unlike the frog tadpole, the toad tadpole remains almost jet black until its legs appear.

Procedure: Direct the pupils' attention to the first row of pictures. Ask, "In this row of pictures what animal grows up?" Have the children turn back to the frog on page 12. "How is the toad different from the frog?" After the likenesses and differences have been noted, continue with the discussion of the toad by saying, "In which picture is the toad the youngest? What do we call it? In which one is it partly grown up? Is it the same color as the partly grown-up frog on page 12? In which picture is the toad fully grown?"

Continue in the same way with the next two rows (screech owl and bluejay), having the pupils decide upon the correct sequential arrangement. Make sure that the children do not formulate the generalization that all baby birds are the same color as their parents and have the same kind of body covering.

Have the pupils indicate the correct sequential arrangement for the last row of pictures (Polyphemus moth), and then direct them to turn to page 13. Lead them to note the differences between the two moths, caterpillars, and cocoons.

Extending and Enriching Activities:

1. Make a chart, and on it mount pictures indicating the sequential nature of the growth of other animals. Pictures to use for this purpose may be obtained from magazines. The children may have pictures of their own pets taken at different stages in their growth.
2. Have the children bring to the classroom baby pictures of themselves and tell how they have changed since babyhood.
3. Study the class height and weight chart (or begin making one, if none exists) to trace changes in the pupils' height and weight as they grow older. Discuss other phases of human growth, particularly tooth development, increase in strength, and rise in intellectual and muscular skills.

Page 15

Relation to the Unit: To determine the pupils' ability to apply their knowledge of the common characteristics of mammals in distinguishing between animals that are born and those that are hatched.

Procedure: Direct attention to the first row of baby animals and have the pupils identify them. Then say, "Three of these baby animals are more like one another than they are like the fourth. Can you name the three? In what ways are they alike?" Elicit that they have the same general body parts and that their bodies are covered with hair. Then say, "Can you tell any other ways in which they are alike?" If the children hesitate in giving the correct reply—that they are born and that they get milk from the mother's body—refer to pages 4 and 10. Ask, "What general name do we give animals like these? In what way is the young bird different from the mammals?" The children's responses should include the facts that it differs in body form, parts, and covering, that it is hatched, and that, when it is a baby, it does not get milk from the mother's body but eats the same general kind of food as its parents.

Continue with the other rows, eliciting that the caterpillar in row 2 and the young frog in row 3 differ in general body appearance and covering from the other animals in those rows. Aid the children to recall that the frog and the caterpillar not only are hatched from eggs but also will pass through many changes in body form as they grow up. The other young animals pictured here do not do this.

Then say, "Look at the young bird, the caterpillar, the young frog, and the chick. Are they the same color? Are they the same shape? Do they have the same body covering? Do they grow up in the same way? There is one way in which these four animals are alike. Can you think what it is? Perhaps if you look at pages 11, 12, and 13, you can tell what this way of being alike is." Aid the children to formulate the generalization that, although these animals may differ in appearance and body parts, they can be considered alike in that they all were hatched from eggs.

Extending and Enriching Activity:

Reëxamine the pictures on page 3. Have the children select the mammals, justifying their selection; then select the birds; then the insects. If time and interest permit, continue with the animals on pages 4-5, 6, 7, 8-9, 10, 11, 14.

Pages 16-17

Relation to the Unit: To present in story sequence the concept that animals must have food to live and grow.

Procedure: Present the title "A Hungry Cat" and direct the pupils to interpret the picture sequence. Ask what kinds of food the cat tried to get and the reasons why in each case it failed. Lead them to notice that the animals escaped by swimming or flying away, by hiding, by retracting into a shell, or by fighting.

Bring out in the discussion that birds are sometimes eaten by cats, as are mice, fish, and insects; but stress the fact that an adequately fed cat is not very likely to attack birds.

Extending and Enriching Activities:

1. Encourage the children to tell humorous stories of adventures their pets have had while searching for food.
2. Discuss ways in which pets must be cared for and list the rules a good master follows in bringing up a pet.
3. Observe the kinds of food local animals eat, stressing the variety of most diets. Children are apt to have erroneous preconceived ideas, such as that cats eat only milk, dogs eat only meat, birds eat only worms, etc. This erroneous preconception should be changed, and the wide variety of foods acceptable to many animals should be stressed.
4. Discuss the importance of food as a factor in growth, life, and health.

Page 18

Relation to the Unit: To present an example of a baby bird that eats the same type of food as the parents but must be both fed and sheltered by them.

Concepts:

A. Young birds do not nurse but eat the same type of food as their parents.

B. Young birds that cannot move about competently are given help in getting food.

C. Young birds that cannot move about competently are sheltered by their parents until they can.

D. In the case of some birds both the male and female take care of the eggs and the young birds.

Information for the Teacher: The finches are primarily seed eaters, but they consume many insects and worms during the summer and wild fruits during the fall. The goldfinches bring up their youngsters for the great part on "cereals." These are served warm, for the parent birds swallow the seeds after cracking the hard coats and feed the youngsters by regurgitation.

Like the scarlet tanagers, the male goldfinches go through a plumage change. In the summer they are a brilliant yellow and black, while the females are a brownish yellow. In the winter, one can hardly distinguish the sexes, both being a brownish yellow, except that the males have somewhat blacker wings with more prominent white markings.

Procedure: Direct attention to the two pictures of the goldfinches at the top of the page. "Have you ever seen birds like these? Do you know their names? Can you guess which is the male and which is the female?" If the pupils cannot justify their answers, have them turn back to page 11 and note the brilliant coloring of the male tanager and the duller coloring of the female. At the same time they should note how the eggs of the tanager and the goldfinch differ.

Then direct attention to the third picture, in which the birds are about two days old, and tell the children how the little birds are fed. Ask, "Why can't the little birds get their own food? How is the way they are fed different from the way the baby skunks and foxes were fed?

"Which bird is on the nest in the fourth picture? What is she doing? Which bird is on the nest in the second picture? What is he doing?" Elicit that both the male and the female goldfinch share the responsibility of keeping the eggs warm until they are hatched and then of keeping the naked birds warm and sheltered from the wind and the sun.

Now direct attention to the fifth picture, in which the birds are from two to three weeks old, and say, "In what ways are the young birds like their parents? In what ways are they different? Do you think that these baby birds can fly—can hop? Can they get their own food now?" Lead the children to see that although the babies can hop and flutter about a little, they cannot fly to the ground to search for food.

In the discussion of the last picture, in which the young are three to four weeks old, ask, "Can the baby birds fly now? How do you know? Do they eat the same food as their parents? Can they get it for themselves? Why not?" Lead the class to see that although the young birds can fly to the ground, they are not mature enough to fly far nor experienced enough to locate their own food.

Direct the pupils to turn back to pages 4-5 and 10 and compare the care and feeding of the baby foxes and skunks with that of the baby goldfinches.

Extending and Enriching Activities:

1. Continue with the work of the bird chart started in connection with page 11.
2. If the season warrants, establish a feeding station for birds. (See Appendix, page 60.)

3. Study pictures of birds other than the tanager and finch in which there are color differences in the plumage of the male and female. The children should note that in these cases the male is usually more brilliantly colored than the female.
4. Find out what foods are commonly eaten by birds in the vicinity. After listing the diet of each bird, discuss the bird's value to the farmer.
5. If the lesson is studied at nesting time, put out material for nest building, particularly yarn cut in 8- to 12-inch lengths.
6. Make a study of bird calls, nest construction, or (in winter) bird tracks, etc., to develop other bases for distinguishing birds. Bird nests should be removed from trees and bushes only after the birds have abandoned them.

Page 19

Relation to the Unit: To present an example of a baby bird that eats the same food as the parents but does not have to be fed or sheltered by the parents for a long period of time.

Concepts:

A. Baby birds do not nurse but eat the same kind of food as their parents.
B. Many baby birds can move about competently immediately after hatching.
C. Baby animals that can move about independently do not require extensive help in getting food.
D. Baby animals that can move about competently are not given so much protection as those that cannot, nor are they given protection for so long a time.

Information for the Teacher: The eggs of the quail, twelve to eighteen in number, are laid in a nest built on the ground. Both the father and the mother share in the responsibilities of the incubation period, which lasts twenty-four days. The young are brooded at night for three weeks after they are hatched; then they care for themselves. By fall they are full-grown, but the family remains together until spring, often living with other quails in coveys. They gather at night in a compact circle, heads out and tails in; this arrangement affords both warmth and defense against enemies.

In the discussion develop such words as *quail*, *covey* (optional), *brood*, *protect*, etc.

Procedure: Ask the pupils if they have ever seen a bird like the one shown in the first picture and have them tell what they know about it. If the bird is unfamiliar to them, tell them it is a female quail. Explain that the quail is sometimes called a bobwhite, because of the call of the male bird. Have them note that the nest is made on the ground, where it is shielded by bushes. The nest is frequently built in tall grass, often drawn together above to form a protective canopy.

In studying the second picture, the children should note the number of eggs and their white color. Draw attention to the male bird shown in this picture, and discuss likenesses and differences in the plumage of the male and the female.

To lead the pupils to see that the babies are able to move about freely and are well covered with down as soon as they are hatched, have them study the third picture and then compare it with the picture of the baby goldfinches in the nest on page 18. Ask, "Do the baby quails look stronger than the baby goldfinches? Why? How is the body covering of the baby quails different from that of the baby goldfinches? How does having their nest on the ground help the young quails? How might it harm them?

"Look at the fourth picture. What are the babies doing now?" Elicit that the young birds have left the nest shortly after hatching, but are kept in a group and led by one or both of the parents. Point out how the adults protect the young and aid them in finding food.

Tell the pupils that in the fifth picture the babies are now three weeks old and ask, "Why isn't it necessary for the mother quail to cover her young ones with her body as the mother goldfinch does in the fourth picture on the opposite page?

"The last picture shows how the young quails protect themselves after they are three weeks old. How does sitting in a circle with their heads facing outward help the young quails? How many young males are there? How many females?"

Lead the children to see that these young birds, because of their ability to walk well almost immediately after hatching and to eat the food at hand, and because of their adequate downy covering and the rapidity with which they develop the ability to fly, do not require so much protection or help in getting food as the baby goldfinches do.

Extending and Enriching Activity:

The children should tell of other birds, such as chickens, turkeys, geese, etc., which have adequate covering and are able to move about competently almost immediately at hatching. These should be compared with other common local birds, such as robins, bluebirds, wrens, etc., that are far more helpless at hatching. The children should compare the extent and length of care required by these fledglings for survival.

Page 20

Relation to the Unit: To present an example of a baby mammal that must be fed, sheltered, and protected from animals that may attack it.

Concepts:

A. Baby mammals when born cannot move about competently.
B. Baby mammals drink milk from the mother's body.
C. Baby mammals are protected by the mother until they are almost fully grown.
D. Baby mammals receive more parental care than the young of other animals.

Information for the Teacher: The young raccoons, from three to six in a litter, are born in April. The blind, helpless babies are carefully cared for by their parents, and the family remains together until fall. Raccoons feed on almost anything eatable except herbage. They are especially fond of fish, which they are adept at catching with their front paws. These animals, with their amusing masked faces, have an interesting habit of washing their food carefully, even in dirty water, before they eat it. They nest in hollow trees, caves, or burrows, and are excellent tree climbers. An adult raccoon weighs about fifteen pounds and is about the size of a small dog. Raccoons are found only in North and Central America.

Procedure: Present the title "A Raccoon Protects Her Babies" and have the pupils interpret the picture sequence; then bring out through discussion the types of care the mother raccoon gives her babies, including food, shelter, transportation, and protection from animals that seek them for food. Ask, "Why can't the baby raccoons care for themselves?" Lead the pupils to see that they are unable to get about competently, that they cannot get suitable food for themselves, that their teeth are not well developed, and that their claws do not give them adequate protection against their enemies.

Extending and Enriching Activities:

1. If there are raccoons in the vicinity, ask the children to look for their tracks near the streams and then describe them to the class.
2. Visit a zoo and watch the eating habits of the raccoons.
3. Reëxamine pages 4-5 and 10 to find other young mammals and tell how they are like the raccoons.

Page 21

Relation to the Unit: To present an example of a baby bird that is competent to move about and get its own food but is not able to protect itself from its enemies.

Concepts:

A. Many baby birds can move about competently.
B. These baby birds eat the same types of food as the parents, rather than special types of food, and secure it themselves.
C. These baby birds cannot defend themselves and are protected by their parents.

Information for the Teacher: The Canada goose, the largest of our wild geese, measures from thirty-five to forty-three inches in length. The nests, which are made of sticks and lined with down, are found along the shores of streams. Only four or five eggs are laid, and both parents participate in the care of the young. The gander also bravely defends his nest and family from the attacks of all aggressors. He uses his great, powerful wings to beat off his assailant and his strong-toothed beak to give a vicious bite.

During the discussion develop such words as *goose*, *gander* (optional), *gosling*, *attack*, etc.

Procedure: Follow the same plan as that used on page 20 in presenting the title "Geese Protect Their Babies" and in having the children interpret the picture sequence. Lead them to enumerate the various types of care given the young, the location and acquisition of food, and the protection afforded the young from animals that might attack them.

Have the children discuss, in the first picture, the care the mature geese are giving the babies. Then ask, "What care do you think the parents might have given the eggs before they were hatched?"

Call attention to the second picture, which shows one parent nudging the small ones into the water. Bring out the fact that, while the adults do not actually feed the goslings, they bring them to a place where the food may be found, and soon the little ones are diving for it.

Use the third picture to form a basis for a discussion on the protection of the young. Point out how the mother hovers over the goslings while the male assumes the active rôle of attacking the aggressor.

Have the pupils note in the fourth picture how the male seizes the fox by the ear and how he uses his powerful wings for combat purposes. Stress the amazing strength of the wings and the absolute fearlessness of the male, even though the fox appears to be a larger and more formidable animal.

Extending and Enriching Activities:

1. The goose is a much maligned creature of story and fable. Actually all varieties of geese, as well as the Canada goose, are brave and intrepid defenders of their mates and their young. Collect and read stories about the bravery of geese.
2. Compare the goslings with the young finches, and bobwhites (pages 18, 19) with regard to (a) extent and type of body covering shortly after hatching, (b) ability to move about competently shortly after hatching, (c) extent of parental help needed in feeding, and (d) parental protection required.

Page 22

Relation to the Unit: To review and summarize the need of certain baby animals for protection by their parents.

Information for the Teacher: The animals shown on this page are robin, lion cub, rabbits; colt, opossums, chipmunk; calf, bear cub, fawn; puppy, lamb, and leopard cub.

Procedure: Direct the children to look at all the pictures on the page; then ask, "Do all of these baby animals need protection? Why?" (The birds cannot fly from danger; the rabbits, opossums, puppy, chipmunk, and lion and leopard cubs cannot run rapidly enough to escape.) Point out that, while these baby animals are able to move with varying degrees of speed, none is swift enough to escape from the hungry animals that might attack it. Bring out the idea that all the animals shown are too weak to stand their ground alone and fight. Explain that, with such animals as the calf and the colt, care and protection are largely afforded by man, and that these animals do not normally meet the dangers they would encounter in an undomesticated state, although domesticated mammals unhesitatingly defend their young from danger.

In order to bring out the generalization that all the animals pictured need protection until they are sufficiently mature to fend for themselves, ask the class, "Why do all these animals need their parents to care for them?"

Page 23

Relation to the Unit: To present examples of baby animals that receive no protection or care from their parents.

Concepts:

A. Many baby animals that move about competently receive no protection from their parents.
B. Many baby animals that develop a hard, protective body covering receive no protection from their parents.
C. These animals eat the same kinds of food as their parents.

Information for the Teacher: A very few snakes bring forth their young alive, but since these are probably beyond the children's experience, they should not be mentioned.

The female alligator often remains in the general vicinity of the nest, but does not brood the eggs or protect the young.

Although the shells of turtles and snails at the time of hatching are not hard enough to give them protection from larger animals that prey on them, these shells later harden and become tough.

To permit ease of illustration, the nests pictured on this page are shown exposed to view. In reality the eggs are buried in the sand or earth or laid in a mound of grass and twigs.

Procedure: Direct the pupils' attention to the first picture and ask, "What kind of animal do you see in the first picture? What has just happened to the turtles?" Tell the pupils that the mothers of all the baby animals pictured on this page merely deposited their eggs and gave no protection either to the eggs or to the young after they were hatched. "What are the little turtles doing? What do you think they might be looking for? If an animal should try to eat them, what would they do?" Elicit that the young turtles would hide in the grass or dive into the water. Explain that countless numbers are eaten by animals preying on them, but that many will survive because the hatch is so extensive. When the shells have grown harder, they will serve as protection.

"What animals do you see in the second picture? What kind of animal do you think laid the eggs from which they were hatched? When the animals are full-grown, what will they be? How can you tell whether they will be frogs or toads without seeing either the mother or the eggs? What are the tadpoles doing? What do you think they are looking for? What will they do when danger threatens them?" The teacher should point up the discussion in such a way that the children will see how the speed and agility of the tadpoles help some escape from turtles or fish that may prey on them, but many are eaten.

"What do you see in the third picture? These young fish have just hatched. What are the little fish doing? How will they escape from their enemies?" Emphasize again the part that speed plays in their survival and the fact that many do not escape but are eaten.

Say, "In the fourth picture you see both eggs and little animals. What are these animals called? What has just happened to them? What do they do as soon as the egg breaks? What are they looking for? When they are older and their shells are hard, how can they escape from animals that would eat them?" Elicit that the snails will pull themselves into their shells and be safe. "Do you think they can move swiftly? Which of the four kinds of animals that we have talked about are the most alike?

"What do you see in the fifth picture? What are these animals doing? How do they get away from other animals that might attack them?" Lead the pupils to see that the snakes glide away rapidly.

"What are the animals in the last picture? What are they doing? How do they get away from animals that might attack them?" Lead the pupils to see that the alligators either hurry for the water or glide under nearby rocks and leaves.

"We have seen six kinds of baby animals on this page. Although they are very different, there are many ways in which they are alike. Let us see if we can list these ways." The children's responses should include the following points:

1. All of the animals were hatched.
2. In each case there were many eggs and many babies.
3. The tadpoles and minnows hide in the weeds and rocks when escaping from animals that prey upon them; so do the turtles, snails, and alligators until their body covering is thick enough to give them adequate protection.
4. The turtles, snails, and alligators develop hard, protective coverings.
5. The tadpoles, minnows, and snakes use speed when escaping from animals that prey upon them.
6. None of these animals was fed or protected by its parents.
7. None of them received milk from the mother's body.

Pages 24-25

Relation to the Unit: To review the importance of locomotion as a factor in food getting.

Information for the Teacher: This page may also be used to review the types of locomotion that were presented in *Look and Learn;* namely, that some animals fly, some swim, some crawl, some walk, some hop, and some move about in two or more ways.

The animals pictured on page 24 are Rhode Island Red chickens, pintail ducks; goldfinches, rainbow trout; red squirrels, painted turtles. Those pictured on page 25 are cats, turkeys; grasshoppers, snails; rabbits, red-winged blackbirds. (The male red-winged blackbird is shown in his first nesting plumage.)

Procedure: The children should, in each picture, compare the young with the adult, discuss the method of locomotion, and decide whether or not the baby animals at the stage pictured are able to move about competently enough to secure their own food. The children should then point out, on the basis of their findings, which young will need a greater degree of parental help in obtaining food. Their responses should bring out the fact that the young chickens, ducks, turkeys, trout, turtles, grasshoppers, and snails can move about almost as soon as hatched and hunt for food. (The children may recall from their own experiences and previous discussions that the parents of chicks, ducklings, turkeys, etc., usually give assistance in finding food at the early stages immediately after hatching; otherwise, the teacher should tell the children this.) The pupils' responses should also include the fact that the goldfinches, squirrels, kittens, rabbits, and red-winged blackbirds cannot move about efficiently and will have to be fed by the parents.

Extending and Enriching Activities:

1. Classify the baby animals in the picture collection as to ability to move about efficiently at the very early stages.
2. Review types of locomotion: walking, flying, swimming, etc., and find examples of each type.
3. Make up riddles about baby animals, using locomotion and its relation to food getting as the principal theme.

Pages 26-27

Relation to the Unit: To summarize the classification and grouping of many animals included on the preceding pages on the basis of varying factors.

Procedure: All the animals pictured on these pages have been presented on previous pages. Direct the children to look at all the pictures and ask them to find (1) animals that are fed milk from the mother's body (foxes and fawn), (2) animals that eat the same type of food as the parents but are not competent to move about and secure it for themselves (scarlet tanagers and robins), (3) animals that eat the same type of food as the parents and are able to get it for themselves but need to be protected from danger (goslings and chicken), (4) animals that receive no care from their parents (tadpoles, grasshopper, caterpillar, trout fry, turtle, and snail), (5) animals that change shape many times as they grow (tadpoles and caterpillar), (6) animals that are hatched (tadpoles, grasshopper, tanagers, caterpillar, trout fry, turtle, goslings, chicken, robins, and snail), (7) animals that are insects (grasshopper and caterpillar), (8) animals that are birds (scarlet tanagers, goslings, chicken, robins), (9) animals that are mammals (foxes and fawn), (10) animals that have a hard, tough covering (turtle and snail), and (11) animals that use speed for protection (tadpoles, grasshopper, and trout fry).

Page 28

Relation to the Unit: To check the pupils' understanding of the fundamental concepts of animal growth; to promote ability to observe accurately and to perceive the sequent nature of growth.

Information for the Teacher: The correct sequential order for arranging the pictures should be as follows: (1) the small cubs nursing, (2) the tigress carrying a cub in her mouth, (3) the tigress teaching the cubs to hunt, (4) the tigress with one half-grown cub, (5) the tiger, nearly full-grown, and (6) the adult tiger.

Procedure: Say to the children, "These six pictures tell the story of the growth of one young tiger in a litter. The pictures that are numbered 1 and 6 indicate the beginning and end of the picture-story sequence. Can you arrange the other pictures so that they will come in the right order?" Then ask the pupils to indicate the correct sequence for the pictures and cite evidence supporting their arrangement. For example, in the second picture the mother is carrying the cub, whereas in the third picture the cubs are walking with the mother.

UNIT 2 Getting Work Done

General Concepts

A. When things are moved, work is done.
B. We can move things with our own muscles.
C. We can use machines that we operate with our own muscles.
D. We can move things with animals.
E. We can move things with machines that have engines and motors.

Page 29

Relation to the Unit: To introduce the unit theme; to review the concept presented in *Look and Learn* that a machine is a device which aids us in getting work done.

Information for the Teacher: Listed as far as possible by rows, the articles pictured are as follows: broom, crowbar, ice pick, sickle, hand cultivator, garden trowel, spade, file; knife, pruning shears, mason's trowel; pliers, glass cutter, hammer; needle, wrench, rake, squeegee, mop, chisel; pitchfork, shears, scrub brush, screwdriver; brace and bit, rolling pin, putty knife, paint brush; egg beater, potato masher, ax, compass, plane; pocket knife, pick, saw, punch, hoe, electric iron, blacksmith's forceps.

Procedure: As the pupils look at the page, ask, "Is there anything on this page that you have ever seen before? Tell us about it. Where did you see it? What is it used for? Do you know how it works? Did you ever use one?" If any articles are unfamiliar, help the children identify them, or ask for volunteers to report to the class at the next meeting the names and uses of the articles in question.

Bring into the classroom some of the articles pictured and have individual pupils select one in order to show the class how it is used. If a child chooses a scissors, for example, guide the demonstration by saying, "Tell us what a scissors is used for. Show us what you do with it. Will a scissors cut things all by itself?" Responses should include the fact that we must use our own muscles to make the tools work. Then, holding up a picture on a magazine or newspaper page, ask, "Without a scissors do you think you can remove this picture from the page? Try it." Then have the pupil cut a picture from another page and ask, "Which is the easier way? Which way gets the work done faster and better?" Continue in the same manner with other tools as long as interest and time permit.

After the demonstrations ask, "What do all these articles help us do?" When the pupils respond that the tools are used to do work, or to get work done, present the title "Getting Work Done" and tell them that the next part of the book will be about the way people get work done. Ask, "What general name can we give all the things pictured on this page?" Pupils who have used *Look and Learn* will probably say, "Machines." For those who have not, or who reply merely, "Tools," develop the generic term *machines.*

Pages 30-31

Relation to the Unit: To introduce concepts of the unit informally in a picture-story sequence.

Concepts: When things are moved, work is done; man uses different types of forces and machines to get work done; machines enable us to use our energy more efficiently.

Information for the Teacher: At this time it is advisable for children to get a preliminary idea of the term *energy*, which is one of the most important concepts in science. Energy, according to the scientist's definition, is the capacity to do work. We can do work (that is, we can move things); therefore we must have energy. This energy, which is stored in our muscles, we can call muscular energy. It is this energy that enables us to push or pull things, that is, exert a force. At this level, of course, we cannot fully develop the scientist's meaning of the term *energy*, but we can develop enough meaning so that the children can use the term with understanding.

Procedure: Before the pupils open their books, ask, "Did you ever hear someone say that he hasn't enough energy to do something? What does he mean? What do you mean when you say you have a lot of energy? Probably you mean that you can work hard, that is, that you can push the lawn mower for a long time or pull a heavy wagon for a long distance. You are able to push the lawn mower or pull the wagon because you have energy. Animals have energy too. Engines and motors have energy. That is why they are able to run machines."

Then ask, "Did you ever see a car that was stuck in the mud?" Encourage pupils to tell of their experiences. "Today we are going to look at pictures that show the trouble some people had getting their car out of a ditch." Distribute the books, present the title "Stuck in the Mud," and have the pupils interpret the picture sequence. They should note in the first picture the type of road, its narrowness and muddy condition. Ask, "What is apt to happen on such a road? What did happen in the next picture? Why is one back wheel lower than the other?"

In talking of the third picture, elicit that the man got out of the car to see how deeply it was stuck in the mud. Then say, "When he got out, the woman started the engine. What happened?" Lead the pupils to see that the mud flew, but the car did not move. "What makes the mud fly out in back?" Explain that the engine is running and turning the wheels, but that they are spinning around and around and the car is not moving forward.

Have the pupils note that in the fourth picture the farmer has left his hayrack and has come back to help. Ask, "What are the two men doing? Why do they stand at the sides of the car to push instead of at the back? What shows that the engine of the car is still running?"

Say, "The two men weren't able to push the car out, and so they tried something else. What do you think they are doing in the first picture on the next page?" Elicit that they are trying to put boards under the wheels to keep them from sinking farther into the mud and to give them something to grip.

Then say, "However, even when they backed the car over the planks, they still couldn't get it out of the ditch. What did they try next? Why do you think they thought the horses would be able to get it out?"

Have the children look at the next picture and then say, "What are they using now? Do you think the tractor will be able to move the car, though the horses failed? Why?"

Then ask, "What different things did the men do to try to move the car out of the ditch?" The pupils' responses should include the ideas that the people pushed, that they placed boards under the wheels, that they tried to pull the car with horses, and that they finally used a tractor. Develop through discussion the idea that the tractor was able to get the car out because it exerted more force. Develop also the idea that the car was moved from one place to another, and that this is what we mean when we say, "Work was done."

Extending and Enriching Activity:

If possible, have the children observe a tow car. They will be particularly interested in the cable, winch, and pulley arrangements that are used, and also the warning blinker lights, spotlights for night work, various tools, etc.

Page 32

Relation to the Unit: To show that many kinds of work are done by muscles.

Concepts:

A. Muscles help us push.
B. Muscles help us pull.

Information for the Teacher: During the discussion develop such words as *muscles*, *push*, *pull*, *lift*, *ramp*, *flex* (optional).

Procedure: Say to the pupils, "In the story on the two preceding pages we found out that, when something was moved from one place to another, work was done. Today we are going to see some other things that are being moved."

Distribute the books and present the title "Muscles." After the pupils have enjoyed the pictures, say, "What work is being done in the first picture? Why do you suppose the circus men used an elephant instead of doing the work themselves? How does the elephant move the wagon up the ramp?"

Ask, "What work is being done in the second picture? How are these men tightening the tent ropes? Could the circus men have used an elephant to do the same job? How?

"What work is being done in the third picture? In the pictures above the elephant is pushing, and the men are pulling. Here the strong man is lifting. If you lifted a heavy book from the floor, would you pull or push?" If there is disagreement, make sure the pupils see that lifting up to the arm level is pulling, and after that it is pushing. Then say, "Is the strong man pushing or pulling?

"What work is being done in the fourth picture? What do the ponies do as they move the cart around the ring, push or pull?

"Does anyone know what parts of our bodies we use when we push or pull things?" Point to the title and say, "Do you know where any of the muscles in your own body are?" If some of the pupils are unable to give examples, direct someone to rise, walk across the floor, lift a book from a shelf, and bring it back. Elicit that muscles in the arms, legs, and hands were the principal ones used. Have the pupils feel muscles in the arms and legs as they are flexed. "Now look at the elephant again. What principal muscles do you think he is using? Is he using them to push or to pull?"

Continue with the other pictures, noting the contracted muscles in the arms, legs, and backs. At the close of the lesson help the pupils formulate the statement that we use muscles (voluntary) located in various parts of the body to push or to pull things.

Extending and Enriching Activities:

1. Have the children keep a list of their play and work activities during the day and list the principal voluntary muscles used.
2. If the pupils have listed the moving of loads in their activities, have them decide, through pulling and pushing, which is the easier way of moving loads, particularly of lifting them. *At no time should any child be permitted to overtax his strength.*

Page 33

Relation to the Unit: To show that machines which we operate with our own muscles make work easier.

Concepts:

A. Our muscles supply energy or force to move machines.
B. We use less force when we use a machine to help us do work.

Information for the Teacher: During the discussion develop such words as *weight, heavy, load, porter, baggage, ax, wheels,* etc.

Procedure: Say, "This page, called 'Machines and Muscles,' is divided into three parts, and each part shows the same work being done in two different ways. Look at the two pictures at the top of the page. What work is the woman doing in the first of these pictures? Yes, she is carrying groceries. She is also walking." If the children question the fact that walking is work, ask, "Didn't you ever get tired when you walked for a long time?" Then say, "What work was done in order to get the groceries into her arms? What work is the woman doing in the second picture?" (Walking and pushing the groceries in a wheeled basket.) "What is holding the groceries now? If the large basket did not have wheels on it, would it be as easy to move the basket? Why not? In which picture does the work look easier? Why?" Bring out the idea that in the first picture the woman has to move herself and the total weight of the groceries, while in the second picture the wheels support the weight of the groceries. Then say, "What name do we give things that help us do our work? Is the basket with wheels a machine? Why? In what other way is the machine helping the mother?

"Now look at the next row of pictures. What work is being done? Is the man using a machine in either of these two pictures? In which of these two pictures does the work look easier?" (No point need be made of the fact that through the use of the ax, force is more efficiently applied, since it is applied to a sharply defined and limited area.)

"What work is being done in the last two pictures? What work did the porter do before he got the baggage into his arms or into the truck? Is the porter using a machine in either of these pictures? In which picture does the work look easier? In which picture is the porter able to move more baggage? Why?" Again elicit that the wagon supports the load and that the wheels make it easy to move the load across the ground.

"Look at the six pictures on the page. Find the three that show the work being done easily. What are all the people using? When people use machines to help them, do they have to work as hard as they do when they have no machines?"

Extending and Enriching Activities:

1. Discuss some non-motor machines commonly used by children such as a scissors, broom, wagon, etc. Discuss how each reduces the muscular energy required to do the work. Discuss whether the work could be done by muscles alone, eliciting that in many phases of modern life there is no feasible substitute for a machine; for example, a can cannot be successfully opened with muscles alone; cloth cannot be cut with muscles alone. Children usually enjoy listing activities that require the use of machines.
2. Recall the work done in activity 2 of the previous lesson. Discuss ways in which non-motor machines could have been used. Some pupils may be sufficiently familiar with the fixed pulley to suggest its use in lifting. If so, bring a small pulley to the classroom and demonstrate its use. Pupils familiar with the pulley may be able to deduce its presence in picture 2 on page 32.

Page 34

Relation to the Unit: To show that we can move things with animals.

Concepts:

A. To save our own energy, we often use the muscles of animals to get work done.
B. Many animals are stronger than man and thus are able to exert more force than man.
C. Man trains some kinds of animals so that they can be used to supply force for machines.

Procedure: Turn back to page 32 and say, "Why did the circus men use the elephant to push the wagon up the ramp? One elephant could push the wagon. Do you think one man could?" After their response that the elephant was stronger and could push harder, thus exerting more force, have them turn to page 34. Present the title "Machines and Animal Muscles." Say, "This page, also, shows three kinds of work being done. In which of the pictures in the top row is the man using his own muscles to make his machine go? We call making a machine go *operating* it. What is doing most of the work in operating the machine in the other picture? In which of the two pictures do you think the man will finish cultivating his cornfield more quickly? Why?" Responses should include the fact that, because a horse is stronger than a man, it can exert more force. This enables the farmer to save his own energy and use a machine that will cover more ground, thus getting more work done in a given time.

Continue with the second and third rows of pictures in the same way.

To help pupils make the generalization that to save our own energy we often use the muscles of animals to get work done, say, "Look at the six pictures on the page. Find the three that show the work being done easily. What are the people using? When people use the muscles of animals to operate machines, do they have to work as hard as when they use their own muscles to make the machines go?"

Extending and Enriching Activities:

1. Collect pictures that show various types of work being done by animals. The children should be encouraged to conclude that man's use of animals is generally limited to that of drawing loaded vehicles. This will lead naturally to later conclusions regarding the value of the wide variety of uses to which motor-driven machines can be put.
2. Refer to activity 2 for page 33 and decide whether any of the work listed could be more efficiently and easily done by the use of an animal. Thus, if the children have listed the use of a wagon to bring groceries home, they should point out that a goat or a pony could supply the force needed to pull the wagon.
3. Make careful observations regarding the use of animals in everyday work.
4. Pupils who have used *Look and Learn* should review the value of the wheel.

Page 35

Relation to the Unit: To show that we can move things with machines that have engines and motors.

Concepts:

A. Motors and engines supply energy to run machines.
B. Motors and engines use electricity or fuel as a source of energy.
C. Many motors and engines have greater power than human beings or animals and therefore can do heavier work.

D. Power-drawn or power-driven machines can do work faster than human beings.

E. Motors and engines must be operated by man.

Procedure: Say, "Look at the picture on the opposite page of the horse drawing the cultivator. Do you know anything else that the farmer might have used to pull the cultivator? Is a tractor a machine? How is it different from the cultivator?" Elicit that the tractor contains an engine that makes the machine go. Then ask, "Do you think that a tractor has more power than horses? Why? Might it pull the cultivator faster than the horses could?"

Present the title "Machines and Motors" and direct attention to the first picture on the page. Say, "Look at the two airplanes. Which one is the glider? How is the glider different from the bomber? Would you call both of these airplanes machines? Which one has engines? These engines need fuel to make them run. Do you know what the fuel is?" (Gasoline.) "Will the engine in the bomber start by itself or must it be started? Who starts the engine? We have said that the glider has no engine. Could it move and rise from the ground by itself? What makes it move and rise?" (Note: The glider, after it casts off the tow rope, is supported by the currents of air that flow past the wings.)

"Look at the second picture. How many machines are being used to remove the snow? With which machines are the men using only their own muscles? In which machine is there an engine? What kind of fuel do you think that the tractor uses? Will the tractor start and stop by itself? Who must do it? Which man will get the snow cleared away the fastest? Why?"

Continue with the third picture in a similar way. Conclude by saying, "The tractor, the airplane, and the snowplow use gasoline. What makes the clippers run?" (Electric current.)

Help the children generalize that (1) engine-driven machines usually reduce the muscular energy required to accomplish a task, (2) they make it possible to do more work in a given period of time, (3) they often permit the doing of work that could not be done by muscular energy alone, and (4) they must all be started and directed by man.

Extending and Enriching Activities:

1. Collect pictures and make models of various types of airplanes. While it is not advisable to introduce theory of flight, children at this level can perceive the relation between the size (weight implied) of aircraft and the number of motors and size (weight implied) of fuselage and wing area. Thus, the fighter plane usually has one motor and a relatively small wing spread, while the bomber and cargo plane usually have two or more motors and a large wing spread.
2. Refer to activity 2 for pages 33 and 34 and decide whether any of the work listed could be done more easily by an engine-powered machine. In most listings it will be apparent that motor power can usually replace animal power, and also that a motor-driven machine can often do work that cannot be done by animals. Thus, a truck with its motor can replace a horse-drawn cart, while a cargo plane can fly.
3. List the motor-driven machines (electric- or gasoline-powered) that are encountered in one day's activities. Tell how each contributed to the ease and speed of doing work.
4. Rural children should discuss understandingly the great importance of machines, motors, and engines to the progress of farm life: the more extensive acreage that a farmer can keep under cultivation, or the larger animal-husbandry programs he can undertake because of the introduction of tractors, planters, combines, milking machines, power shears, etc. City children probably lack sufficient background to understand the value of farm machines other than tractors.
5. If possible, arrange to visit a factory to determine what work is done entirely by human muscles, what is done by machines powered by human muscles, and what is done by motor-driven machines. Children should note the speed with which parts can be turned out if made largely by motor-driven machines rather than by hand.

Pages 36-37

Relation to the Unit: To expand knowledge of the use of machines and to compare and contrast different methods of getting work done.

Concept: Different types of force may be used to do the same work.

Information for the Teacher: The small pictures on page 36 show: man and pack mule, automobile, man with horse-drawn drag; man with mule-drawn scraper, men lifting beams with derrick, men driving dog sled. Those on page 37 show: man using hand roller, man using horses to drag beam, man using caterpillar tractor to drag beam; cargo airplane, gasoline roller, gasoline shovel and dump truck.

Procedure: Direct attention to the four pictures at the top of the two pages, and during the pupils' interpretation stress the fact that in the first picture the men are moving themselves and a load from one place to another; in the second, they are digging a hole for a basement; in the third, they are moving a heavy steel beam; and in the fourth, the man is pounding down the earth before concrete is laid over it.

When the pupils have finished discussing the four large pictures, say, "Now look at the small pictures. What did we say the men were doing in the first big picture? Do you find any small pictures that show other ways in which people move from one place to another and carry loads? Can you find pictures in which the man does not have to do much work because animals are moving the load? Find pictures in which machines with engines carry the load. What makes the engines run?

"Do you find any small pictures that show other ways in which men might dig a hole for a foundation?

"Are there any small pictures that show other ways of moving the heavy beam?" In each case elicit the main source of energy.

"Do you find any small pictures that show other ways in which men could flatten or smooth the ground? Which of these pictures shows a man using only his own muscles to operate the machine? Which picture shows horses using their muscles? Does the man driving the horses use his muscles at all? Does the man operating the gasoline roller use his muscles at all?"

At the close of the lesson lead the children to formulate the generalization that many different forces and kinds of machines are used by men to get work done; and that, when men use a machine with an engine or a motor, they gain time and generally use less of their own energy in accomplishing a given task.

Extending and Enriching Activity:

Reëxamine pages 36-37 and discuss the time element involved in the various ways of doing work. Thus, the mountain climbers could eventually move as great a load as the cargo plane can, but this would take much more time and muscular energy.

Pages 38-39

Relation to the Unit: To summarize and dramatize the concepts that there are many ways of doing work; that machines save man's energy; and that engine-drawn machines can provide more power than an animal or a man can.

Procedure: Children who are unfamiliar with docks and wharves may need additional background or more detailed questions to interpret these pages, but all children should readily perceive that this busy scene depicts the loading and unloading of supplies and equipment.

Say, "What is this picture about? What do you think might be in those large packing boxes, barrels, and crates? Yes, there might be machinery, food, and all kinds of supplies. What is going to happen to these supplies?" Elicit that they are going to be shipped to various points. If the pupils have visited a factory as previously suggested, elicit that after goods have been manufactured, they must be distributed to the people who buy them.

"What ways of moving or shipping these supplies can you find? Yes, there are ships, trucks, trains, aircraft, horses and wagon. Do you know what we call the boat next to the train?" (A barge.) "What is the little tugboat doing? I am sure that the barge did not cross the ocean with its great waves. Can you tell why?" Elicit that the barge would fill up with water and sink in a heavy sea. "Can you find boats that could carry goods across the ocean?"

"Which way would you ship supplies if you wanted them to arrive very quickly? Would you use the trucks or the horses and wagon to move supplies the greater distance? Why?

"There are many ways in which men are working to load and unload the supplies. What work do you see them doing?" Elicit that some men are wheeling supplies on two-wheeled hand trucks, others are loading dollies (see foreground of page 39), some are loading and unloading trucks, others are operating winches and pulleys on the ship, etc.

"Can you see the man in the cab of the locomotive? He is not helping with the loading and the unloading. What work will he do? Does he work as hard with his muscles as the men who are lifting the packing cases?

"Many of the loaders have machines to help them. Find the little train of loading cars next to the big red freighter. This is run by an electric motor in the first green car. What do you think the man in the green car does?" Elicit that he operates the motor. "See how big a load can be moved at one time by this little train. Can it carry a bigger load than the men can with their two-wheeled hand trucks?" (See left foreground, page 38.) "Can it pull as big a load as the train on page 39 can? Why not? Who works harder, the man who will drive the little electric train or the men pushing the two-wheeled hand trucks? Which can carry more at one time, the man with a hand truck or the man carrying the box on his shoulder?" (See right foreground, page 39.) "Are there any boxes in the picture that look far too big and heavy for the man to carry on his shoulder? How are they being moved? Do you know why the man rolls the barrel instead of carrying it?"

Tell the children to find the machines that have engines. (It is not necessary that the children name the electric truck in the center foreground, but they should name the ships, the tugboat, the delivery trucks, the train, the electric loading train, the cargo plane, the cranes, and the dirigible.) Ask, "Will these machines do work by themselves? Who must drive them and start and stop them?

"Of all the work being done on these pages, what would you like to do best? Why? How much would you have to use your muscles to do the work that you like best? Find men who must use their muscles a great deal to do their work. Find men who use their muscles less because they have machines to help them. Which will use their muscles more, those whose machines have engines or those whose machines have no engines?"

Extending and Enriching Activity:

If possible, take the children on an exploratory trip to any busy place—docks, railroad freight yard, wholesale food market, grain elevator, etc.—and have them observe first-hand the work being done, machines being used, etc. Conduct the discussion along the lines suggested in the lesson plan above.

Page 40

Relation to the Unit: To check the pupils' understanding of the concepts presented in the unit.

Procedure: Each row of pictures presents examples of ways of moving from one place to another. The pupils are to examine each row and decide which method requires the greatest expenditure of human muscular energy, which requires less, and which requires the least. The pupils should also select the quickest method of getting from one place to another and should perceive that with motor-driven machines greater distances can be covered in a given period of time.

Extending and Enriching Activities:

1. Arrange or draw similar pictures to show the efficiency of methods of getting from place to place. The pupils should justify their arrangement.
2. Cut out or draw pictures of other types of work being done by human muscles alone, animal muscles alone, machines plus human muscular energy, machines plus animal muscular energy, machines plus motors. Arrange on the basis of ease in accomplishing the work, speed in completing a given task, and amount of work possible in a given time.

UNIT 3 Sun, Wind, and Weather

General Concepts

A. There are many kinds of weather.
B. The sun appears to rise in the morning, describe an arc overhead, and set in the evening.
C. The sun gives us light and heat.
D. Temperature is an important factor in determining what the weather will be and thus affects our daily activities.
E. The wind has force.

Page 41

Relation to the Unit: To promote discussion of the different aspects of weather and weather changes; to provide opportunity for the teacher to explore the pupils' background and familiarity with terms used in describing weather.

Concept: Many different elements make up weather.

Procedure: Display the picture, tell the pupils that it is the title page for the next unit, and ask them what they think the unit will be about. Then present the title "Sun, Wind, and Weather" and discuss the picture in detail. Elicit that the picture presents a partially cloudy day, a warm day, a windy day, a partially sunny day, perhaps a midsummer day (certainly not a fall or winter day). Have the children cite evidence from the picture to justify their answers. Note the vocabulary they use in describing the weather conditions.

Pages 42-43

Relation to the Unit: To present in story form the aspects of weather combinations and their effects upon animal and human activities; to review weather concepts developed in *Look and Learn.*

Concepts:

A. Sun, moisture, temperature, and wind are elements of weather.
B. Weather combinations vary.
C. Weather changes may take place rapidly.
D. Weather changes can often be predicted from the condition of the sky.

Procedure: Present the title "A Day for Ducks" and allow the pupils to enjoy the picture sequence. Then discuss the pictures in turn. In the first picture of the series have the pupils discuss the type of farm activities that go on during a pleasant, sunny day and the different animals, farm buildings, and equipment shown. Then have the pupils describe the kind of weather portrayed in the picture, the early spring season, the absence of wind, the absence of clouds, the probable warmth, etc.

In the second picture the children should describe the elements of weather portrayed, telling how they differ from those in the first picture, pointing out everything that indicates that the weather has changed, and predicting other probable changes to come.

In the third picture the pupils should again describe the kind of weather shown, the signs which indicate that it will probably rain soon, the reasons why the farmer is rushing the sheep to shelter, why his wife is putting the chickens in the coop, and why there is no sunshine.

In the fourth picture the pupils should discuss the weather shown and the fact that some farm animals like and do well in wet weather. After the four pictures have been studied in sequence, have the pupils characterize each picture briefly in terms of sun, moisture, wind, and temperature. Conclude the lesson by asking, "How has the weather changed during the day? Have you seen weather like this? How can you tell what weather will be like during the day?"

Extending and Enriching Activities:

1. Have the pupils tell stories about their "weather" adventures, such as a picnic spoiled by a sudden rainstorm, etc.
2. Keep a weather chart. The chart on page 47 of *Look and Learn* indicates one feasible way of representing weather changes pic-

torially. The teacher may find, however, that children at this level are capable of more complex description and wish to add text or other pictorial information. The weather chart should be arranged so that information regarding temperature can be added during the work on pages 48-53.

3. Collect pictures about and discuss ways in which weather changes affect human activities and dress, and also animal activities.

Page 44

Relation to the Unit: To show that the sun appears to rise in the morning, describe an arc overhead, and set in the evening; to show that the sun gives light.

Concepts:

A. The amount of light we get from the sun depends upon how high the sun is in the sky.
B. Shadows change in length and position according to the position of the sun in the sky.
C. When we receive no sunlight, it is night.
D. The apparent movement of the sun divides the day into time intervals.

Information for the Teacher: The expression "apparent movement" of the sun is used because, of course, the sun itself does not move. Since the earth rotates from west to east, the eastern part of any region is the first to get to the point where the sun is visible. Thus it appears that the sun is rising in the east. These concepts should not be presented at this time.

Procedure: Present the title "Sun Time" and say to the pupils, "Although all of these pictures show the same place on the same day, each picture, in which you are supposed to be looking south, is different from the others because the pictures were painted at different times in the day. The first picture was painted just before the sun came up. Do you know what we call that time of day?" (*Dawn*, *sunrise*, *daybreak* are all acceptable answers.) "The second picture was made in the middle of the morning or in the forenoon. How is it different from the sunrise picture?" After the response that the sun is up in the second picture, ask, "Is there more light outside at this time of day? Why? How have the colors of things changed now that the sun is up? What do you see in this picture that you did not see in the sunrise picture?" (Shadows) "Why are there no shadows in the sunrise picture? The third picture was painted at noon. What differences do you see between it and the second picture?" Responses should include the ideas that the sun is almost overhead and consequently does not show in the picture, that the colors are brighter, the light is stronger, and the shadows are shorter. Ask, "What differences do you see between the third and fourth pictures? What time do you think it is in the fourth picture? Is the shadow of the tree in the afternoon picture in the same place as it was in the noon picture? The next picture was made just before sunset. What differences do you see between the afternoon and the just-before-sunset pictures? How is the last picture different from all the others? What time is it now? What has happened?"

Following the picture interpretation, quickly review the common time divisions of the day by directing the pupils to point out the pictures that show noon, night, sunrise, etc.

Then ask, "What do the pictures show about the change in the position of the sun in the sky?" (In the morning it was low in the sky; then it appeared to rise; at noon it was overhead; at dusk it was far down in the sky.) "Where was the sun in the sky when it made the shortest shadows? What changes took place in the shadows from morning until night? When the shadows were shortest, what time was it? How do the pictures show that the amount of light that the sun gives us changes? When does the sun give us the most light? When does it give us no light?"

After all the comparisons have been made, review the names of the time intervals shown.

Extending and Enriching Activities:

1. Have the children make a shadow stick by driving a nail about three inches long near one side of a square board. Place the board so that the nail will be at the southern side and put it in a place where the sun will shine on it all day. Then mark the shadows at 9 o'clock in the morning, at 12 o'clock noon, and at 3 o'clock in the afternoon.
2. Tell the pupils to observe the flagpole shadow at different times of the day.
3. Suggest that they observe their own shadows in the morning, at noon, and in the afternoon.

4. Draw pictures to show what happens to the shadow of some local or school landmark during the day.
5. On the first cloudy day have the children notice what happens to shadows. Explain that the clouds cut off some of the sun's light, and that the shadows become dimmer or disappear entirely.
6. Be sure that the children understand how shadows are formed. Flash a spotlight or flashlight on the wall in a darkened room. Then interpose small common solid objects between the source of light and the solid objects. Elicit that the solid objects cut off the light so that it does not shine on the wall, and thus silhouettes of the objects remain.
7. Children enjoy making shadow pictures with their hands—dog's head, goose, etc. During this play activity review the causes of shadows.

Page 45

Relation to the Unit: To determine the pupils' understanding of the concepts developed in the preceding lesson.

Procedure: Present the title "Do Shadows Help Tell Time?" and then say, "The man in the first picture is starting off to work. It is early morning. What can you tell about the early morning picture? Can you find a picture on page 44 in which the shadows are in about the same position?

"Now look at the second picture on page 45. Why do you think the dog is looking down the street? About what time of day is it now?" (Noon.) "Do you think the man will come home for dinner? Why not? How are the shadows in this picture different from those in the first picture? In what picture on page 44 do the shadows have about the same position as they do in the second picture on page 45?

"Now look at the third picture. How do the shadows look now? About what time do you think it is? Is there a picture on the opposite page in which the shadows have about the same position?

"About what time do you think it is in the last picture? How are the shadows in this picture different from those in the third picture? Find the picture on the opposite page that shows shadows in about the same position."

Then direct the pupils to look at the tree trunk, the grass, the walls of the houses, and roofs. Ask, "Can you think of any reason why these things look different in each picture?" Elicit that, when the light shines directly upon these things, the colors appear to be brighter.

The children should again formulate the generalization that the shorter the shadows, the higher the sun is in the sky, and that the longer the shadows, the lower the sun is in the sky. The pupils should also note that when shadows are shortest, it is noon, and that when they are longest, it is either early morning or late afternoon, depending upon the position of the sun.

Extending and Enriching Activities:

1. If the children have evidenced interest in the shadow stick previously suggested, they may enjoy marking off the hour intervals and making a shadow clock.
2. Tell the children about the sundials used in early days for telling time. If there is a sundial in a nearby garden, the children may observe it and compare it with their own shadow clock.

Page 46

Relation to the Unit: To present in story sequence the concept that the sun gives us heat.

Concepts:

A. The amount of heat received from the sun varies with the time of day.
B. Temperature is important in determining our daily activities.

Procedure: Distribute the books and present the title "On and Off." Tell the pupils that in the first picture it is about eight-thirty in the morning and that the little boy is starting for school. Then ask, "What is he doing? Why is he doing this?" Elicit that, when he got outside, he found the weather was too cool for just a sweater.

"In the forenoon at recess time the boy wore his coat outdoors, but he took off his coat before he began to play. Why?

"What do you notice about the length of the shadows in the third picture? What time do you thinks it is? What do you notice about the colors of the house in this picture as compared with those in the first picture? What is the boy doing with his coat now? Why?

"In the fourth picture the boy has finished his lunch and is on his way back to school. Why didn't he wear his coat or bring it with him?

"About what time do you think it is in the fifth picture? What are the children doing that would help you know what time it is? How do the shadows tell you that it is no longer noon? How are the shadows in this picture like those in the second picture? How are they different? When the boy came out to play this time he didn't put on his sweater. Why do you think he left it in the cloakroom?

"What has he done with his coat in the last picture? Why? What time of day do you think it is now? What makes you think so?"

In the summary lead the pupils to note that, as the sun got higher in the sky, the temperature became warmer and that the warmest part of the day came in the early part of the afternoon. As night approaches, the temperature usually becomes lower.

Extending and Enriching Activity:

Have the children tell how temperature changes during the day (not from day to day) affect people's dress and people's and animals' activities. The children may point out the adjustment of clothing to temperature changes, the tendency of many animals to avoid the heat of summer noons and afternoons by standing in the shade, etc.

Page 47

Relation to the Unit: To develop the idea that the amount of heat we receive from the sun is affected by various conditions.

Concepts:

A. It is warmer when the sun is shining than when it is night.

B. When clouds come between us and the sun, some of the sun's heat is cut off.

C. During the day it is warmer in the sun than in the shade.

Procedure: Present the title "Which Is Warmer?" Then say, "Look at the pictures in the top row. In which of these pictures would the boy on the opposite page be more likely to have on a sweater or a coat? Why?" Responses should include the fact that he would probably wear a coat in the night picture, since the sun gives heat, and the sun does not shine at night.

"In the second row we see pictures taken at the same time of day on two different days. In which picture do you think it is cooler? Why?" Pupil responses should indicate that they note that clouds have come between the earth and the sun; thus not so much direct sunlight nor heat will be present.

"Now look at the last row of pictures. In which one is the boy in the sunshine? How can you tell?" (His shadow is visible in the first picture.) "In which picture do you think he is cooler? Why?" Responses should include the fact that it is cooler in the shade than in the sunshine.

To lead pupils to generalize that the time of day, clouds, and shade affect the amount of heat we get from the sun, say, "We know that the sun gives us heat, but what things can cut off part of the sun's heat?"

Extending and Enriching Activity:

If any question has been raised about which is the correct picture in each pair, have the children duplicate the situations and decide about the relative amounts of heat. The discussion may be used as a natural lead into the subsequent work on the thermometer.

Pages 48-49

Relation to the Unit: To show that a thermometer registers changes in temperature.

Concepts:

A. When the liquid in the thermometer goes up, it is getting hotter.

B. When the liquid in the thermometer goes down, it is getting colder.

Information for the Teacher: On this page the pupils are introduced to the value and technique of experimentation. Consequently, great care should be taken to develop, in addition to the lesson concepts, the correct procedures in performing an experiment. The pupils should understand that the little girl has a question to which she is trying to find a definite and accurate answer. She assembles the materials needed; she follows a planned procedure with those materials; she observes the results and from her observations draws a conclusion that answers her question.

Most pupils can perceive, through this and subsequent experimentation pages in *All Around Us*, that it is possible not only to find the answer to a question but also to prove it; and that if the conditions, procedures, and materials of an experiment are exactly duplicated, the results obtained will always be the same.

Before beginning these pages, obtain an inexpensive thermometer similar to that shown (two thermometers are needed if there is no room thermometer) and the other materials shown.

The water shown in picture 1 on page 49 is not boiling water. What we call "steam" is shown in order to represent heat pictorially. Do not use boiling water in the classroom experiment.

In most schools, pages 48 and 49 will be taken up on different days. For this reason they are presented in such a way that each page is a learning unit, even though both pages should be completed before the full answer is given to the question.

During the discussion develop such words as *thermometer*, *temperature*, *experiment*, *question*, *answer*, *prove*, *heat*, *liquid*, etc.

Procedure: Introduce the classroom thermometer for discussion by saying, "Sometimes we feel that our room is too hot or too cold, but before I ask the engineer to make the room warmer or cut down the heat, I usually walk over here and look at this." Point out the room thermometer. "Who knows what this is called?" If the children do not know, tell them. "Why do I look at the thermometer? What does it tell me?" Elicit that the thermometer tells how warm the air in the room is.

Have the children look again at page 47. Say, "Which of the first two pictures showed a warmer time of day? When we answered that question, all we could say was that it was probably warmer in the second picture than in the first. What could we have used to tell us just how warm it was?" Elicit or tell the children that a thermometer could be used because it measures temperature just as a ruler measures size.

Say, "Here is a thermometer we can look at easily. It works just the same way that the room thermometer does. What can you tell about it?" Elicit that there are numbers on the backboard, a glass tube fastened to the backboard, a bulb and a red (or silver) line. Say, "The glass tube is not solid; it is hollow, and the red you see is red liquid. It is not water, but it can be poured as water can. Where is the top of the red line? What number is it near? Yes, it is near the number 70. So the red line tells us that it is 70 in our room. Seventy is a healthful temperature, and our room is not too hot or too cold."

Have the pupils turn to page 48. Say, "These children have a thermometer, too. They are finding out some things about thermometers." Read the title "How Does a Thermometer Work?" and elicit that the children are going to find the answer to the question. During the picture study and discussion, elicit (1) the materials used, (2) the room temperature shown in picture 2 and its similarity to that of the pupils' classroom, (3) what was done with the materials, and (4) what happened to the liquid in the thermometer. Compare the height of this liquid with the height of the liquid in picture 2.

Say, "This little girl can give part of the answer to the question 'How does a thermometer work?' What did she find out?" Elicit that the girl found out that the liquid in the thermometer fell as it got colder. "We could do this experiment, too, and find out for ourselves if the girl was right. What materials do we need to do this experiment just as the girl did? Exactly how will we do the experiment?" Be sure that the pupils have the problem, the materials, and the procedure firmly in mind. Duplicate the experiment and compare the results.

"What number is the top of the red line nearest now? How do we know the liquid went down when it got cold?

"When we did just what the girl did, we got the same answer. Would we get the same answer if we did the experiment again? How can we be sure? What could we use besides ice to make it cold in this experiment?" Elicit that cold water or snow could be used. Repeat the experiment with cold water, and also with snow if the season permits. Encourage the children to comment on the relative drops in temperature, but be sure they make the generalization that the liquid in the thermometer falls as it gets cold.

Continue in the same way with page 49, presenting the title "What Happens?" Pupils should note that the procedures and materials are shown but that the results are not. The children should formulate the problems to be solved. These should be equivalent to "What happens to the liquid in the thermometer when it gets hot?" (pictures 1 and 2) and "What happens to the liquid in the thermometer when the thermometer is moved from a sunny place to a shady place?" (Pictures 3 and 4.) Perform both experiments. When the second is completed, say, "We know that it is usually warmer in the sunshine than in the shade. How did moving the thermometer help us prove it?"

Pages 50-51

Relation to the Unit: To show how the temperature at various seasons of the year affects what we do and what we wear.

Concept: The amount of heat received from the sun varies with the time of year.

Procedure: Direct a pupil to look at the room thermometer, or elicit that 70 is the average room temperature in cold weather. Then say, "Look at the three thermometers on page 50. Does the top thermometer show a higher or lower reading than the one in our room? What is the temperature? What temperature does the second thermometer show? What temperature does the third thermometer show? What things would you expect people to be doing when it is 90? Look at the pictures and find those in which you think the temperature would be about 90. How are the people dressed? Why?

"How would people dress when the thermometer shows 20? What things would they be doing? Which pictures do you think show this temperature?

"During which seasons of the year would you expect to find a temperature of 55? What would you expect to find people doing? Which of the pictures show people dressed as they would be for this temperature? What are these people doing?"

Have the pupils find all the pictures that show spring, summer, fall, and winter. To help the children generalize that the amount of heat received from the sun varies with the season of the year, ask, "In what season is it likely to be coldest outdoors? When is it the warmest? What seasons are likely to have medium or in-between temperatures?"

Extending and Enriching Activities:

1. The teacher should secure an outside thermometer and have it hung outside the classroom window so that the children will be able to watch the temperatures each day.
2. Add temperature readings to the weather chart the children are keeping.
3. Take thermometer readings at different times of the day to get an idea of daily temperature ranges.
4. Take thermometer readings during sudden weather changes.
5. Have the children turn back to page 46. Have them take thermometer readings at the times indicated: time to go to school, morning recess, noon, afternoon recess, and evening, so that they can interpret the picture sequence in terms of actual temperature. Lead the children to see that with thermometer readings they are now able to give far more accurate weather reports.
6. Cut from magazines pictures of various outdoor human activities and types of clothing. On large charts draw duplicates of the three thermometers shown on page 50 and then paste the cutouts under the correct thermometers.
7. When temperature recordings have been made over a period of time, the children should make deductions regarding prevalent temperature trends in their locality: the highest temperature of the month, the lowest, the range, the median. (Most children do not have sufficient background in mathematics at this level to find a median, but they can be led to note the temperature readings that occurred most often during a given time period.)

Pages 52-53

Relation to the Unit: To extend the idea of the relationship between our activities and the temperature; to check the pupils' ability to see causal relationships.

Concepts:

A. Thermometer recordings indicate to us the kind of clothing to wear.

B. Thermometer recordings influence our control of the heat in our houses.

C. Thermometer recordings tell us when to protect growing plants.

Procedure: "There are two pairs of pictures on each of these pages. The title on each page is

'Why?' Look at the first pair at the top of page 52. What is the woman doing? What is she doing in the second picture? Why did she make the boy wear his warm coat?" Ask questions at this point which will lead children to the generalization that protective clothing is necessary before going out in cold weather.

"Look at the next pair of pictures. What is the man doing in the second picture? Why? Do you think the temperature was above or below 70? Why do you think so? What happens if we stay in a cold room for a long time? What happened to the liquid in the thermometer soon after the man put the coal in the furnace? What experiment did we do that helped you answer?"

"Look at the two pictures at the top of page 53. Do you think that the temperature in the room in the first picture is above or below 70? Why? In the second picture what is the woman doing to make the room cooler? What is the boy doing?

"Now look at the last set of pictures. When the man looked at the thermometer, was it above or below 70?" (The pupils probably have a general idea of the position of the liquid in a reading of 70. If not, have them consult their own thermometer.) "What is he doing in the next picture? Why did he protect the tomatoes when he found that the temperature was quite far below 70? What do we often have in spring and autumn when the temperature falls suddenly?" Elicit that we often have frost.

To summarize the importance of thermometers in our daily lives, say, "On these two pages we have seen people looking at thermometers to find out what the temperature is. How does the thermometer help them decide what to wear and what to do?"

Extending and Enriching Activities:

1. Have the children note the relationship between the temperature and the kind of clothing they wear.
2. Play "games" in which deductions are made regarding behavior influenced by temperature. Thus, one child might say, "Last week I bought some baby chicks and put them in the new henhouse. The thermometer said 50 last night. Before I went to bed, did I light the heater in the henhouse, did I open the window, or did I leave the henhouse the way it was?"

Page 54

Relation to the Unit: To introduce, through a picture-story, wind as one of the factors that compose weather.

Concept: The wind has force.

Procedure: Read the title "A Surprise!" and allow the pupils to enjoy the picture sequence. Then say, "In this story the wind was not a very good friend to the children because it spoiled their party. They were surprised when the wind blew their tent away, but I don't think they should have been. What things do you notice in the second picture that tell you the wind is beginning to blow?" The children's responses should include the slight movement of the sheet and the girl's dress and hair. "Look at the third picture. What tells you the wind is beginning to blow harder?" The children should note the billowing sheet and the rolling clouds. "How do you know the wind is blowing still harder in the next picture?"

Extending and Enriching Activities:

1. Tell other humorous stories about wind action.
2. Tell about, or collect pictures of, toys and equipment that depend upon wind action for successful operation. These might include a pinwheel, a kite, a windmill, a glider (gliders maintain flight upon air currents, of course, but this distinction need not be made), a balloon, a sailboat, an iceboat, etc.

Page 55

Relation to the Unit: To develop the ability to make inferences regarding the force of the wind from observable data.

Concepts:

A. The force of the wind varies.
B. The force of the wind may be told by the effects it produces.

Procedure: The pupils are to examine the sets of pictures in each row, realize that the wind is blowing in both pictures, select the picture in each set that shows the stronger wind, and justify their answers.

After presenting the title "How Strong Is the Wind?" say, "The wind is blowing in every picture on the page. Look at the first picture. How can you tell that the wind is blowing? Can you tell by looking at the cornstalks? Are the treetops in the picture bent over? Would it take a stronger wind to bend the treetops than to bend young corn? Why? Is the wind stronger or weaker in the second picture?

"Look at the next pair of pictures. How do you know the wind is blowing in both pictures? In which is the wind blowing harder? How can you tell?" Call attention to the billowing sail, the tipping of the boat, the waves, etc. Children who are familiar with sailing may call attention to the fact that the mainsail has been lowered to keep the boat from swamping. "In which picture is there likely to be a storm and a still greater wind? How do you know?

"Look at the last pair of pictures. How do you know the wind is blowing in each of these pictures? In which picture is it blowing harder? How can you tell it is not blowing very hard in the second picture?

"Sometimes we say that wind is a friend to people because it helps them. We have talked about ways in which people use wind to help them." Discuss again activity 2 (page 54). "Sometimes wind is an enemy to people because it causes damage. Was the wind an enemy or a helper in the story on page 54? Find a picture on page 55 in which wind is being an enemy." (Picture 5.) "Find a picture in which the wind may become an enemy." Elicit that the man in the sailboat in picture 3 is actually pitting his skill as a sailor against the wind.

Pages 56-57

Relation to the Unit: To show that the force of the wind determines its usefulness to man.

Concepts:

A. Man uses wind force to his advantage.
B. The wind may be man's enemy.

Procedure: Read the captions at the left-hand side of page 56 and then direct the pupils to examine each picture, describe what is happening, and tell whether the force of the wind is helping or harming the people or property in the picture.

Ask, "In which pictures does the wind appear to be blowing gently? In which pictures does it appear to be blowing very hard? Point out in as many pictures as you can find on these two pages the ways in which it does harm. Point out in as many pictures as you can find the ways in which wind may help people. We told about ways in which wind is used by people. Did we name any that are not shown in the pictures? Are any shown that we did not name?"

Page 58

Relation to the Unit: To show that temperature is an important factor in helping us predict what type of wet weather clouds may bring.

Concepts:

A. We have different kinds of wet weather: rain, snow, sleet, and fog.
B. The temperature of the air helps us know whether clouds will bring rain or snow.

Procedure: Present the title "Storm Clouds." Then say, "Look at the first pair of pictures on the page. What season do you think it is? What kind of sky do you see? The temperature in both pictures is the same. What does the thermometer tell you about the temperature? Is it just about as warm as it is in our room?" Be sure that the children understand the warmness indicated by the reading. "Now look at the picture at the right. What kind of weather did the storm clouds bring?

"Look at the next pair of pictures. How is the first picture like the one just above it?" Elicit that both show the same season. "What does the thermometer show about the temperature in the second pair of pictures? What kind of wet weather did the storm clouds bring when the temperature was this low? What did the temperature have to do with the kind of wet weather in the second picture?"

To lead the pupils to generalize that the temperature of the air helps us know whether clouds will bring rain or snow, ask, "When the temperature of the air is warm and there are heavy clouds in the sky, what kind of wet weather do we usually have? What kind of wet weather do the clouds bring when the temperature is cold?"

Extending and Enriching Activities:

1. Make morning sky, wind, and temperature observations and predict the weather for the later part of the day. Note the relation between temperature and type of precipitation.
2. Tell riddles and play games in which the elements of weather, particularly tempera-

ture, are important factors. For example, a child might say, "My father looked out the window before he drove to work. He decided there might be a storm, and so he put chains in the back seat of the car, where they would be handy. Why did he take chains with him? Where do you think the red line in our thermometer was?"

Page 59

Relation to the Unit: To show that changes in temperature bring about changes in weather conditions; to develop ability to make inferences.

Concepts:

A. Rain may freeze and cover the ground with ice when the temperature falls.
B. Snow melts when the temperature rises sufficiently.

Procedure: Present the title "What Happened?" and tell the pupils that the pictures in each row show the same place at different times during the same day. Direct them to look at the first picture, note the temperature, and then look at the picture at the right, which shows the same scene several hours later. Say, "What is happening in the first picture? Is it a warm, rainy day as it was in the second picture on page 58? How do you know it isn't? Do you think the people have their furnace fires going? Yes, it is a cold, unpleasant, rainy day. It would not be fun to be outdoors.

"Now look at the next picture. What differences do you see in this picture? Was there a change in the weather? Why does the little thermometer have a question mark over it? Was there a change in the temperature? How do you know? Did the liquid in the thermometer go up or down?"

Continue with the same procedure for the next row of pictures.

Extending and Enriching Activities:

1. Tell riddles, compare pictures, etc., to give additional practice in the type of deduction required on page 59.
2. Observe sudden weather changes and guess whether changes will take place in the thermometer readings. Verify in each case by reading the thermometer.

Page 60

Relation to the Unit: To review the concepts presented in the unit.

Procedure: Direct the pupils to study the pictures and then to describe each one in terms of weather. These descriptions should be as detailed as possible, and the pupils should decide whether each picture allows them to draw conclusions about approximate temperature, season, type of wet weather, amount of sunlight, force of wind, clouds, and whether the wind is functioning as an enemy or as a helper.

Extending and Enriching Activities:

1. Using the pictures collected for previous activities, summarize the concepts of the unit. Thus, the children might group the pictures according to the weather conditions shown, approximate temperature readings, weather conditions common to each season, wind action, human activities and dress in relation to weather, etc.
2. If the children's interest warrants, continue recording weather reports on the weather chart. Otherwise, have them summarize what the chart has indicated about the weather: temperature range within a day, temperature range from day to day, highest and lowest temperatures for the month, average temperature for the month, extent and amount of precipitation, number of sunny warm days, number of sunny cool days, etc. The children should generalize that weather changes from day to day; that weather changes occur within a day; that temperatures follow a trend within a season, but may vary sharply from that trend and vary during the day; that clouds often indicate rain or snow; etc.

UNIT 4 Plants

General Concepts

A. Livings things have certain characteristics that distinguish them from non-living things.
B. Plants have distinguishing features by which we can tell one plant from another.
C. Plants grow and reproduce their kind.
D. Sufficient light and water are necessary for growth.

Page 61

Relation to the Unit: To introduce the unit theme and to explore the pupils' knowledge of the types and parts of plants.

Procedure: Have the pupils look at the page. Then ask, "Do you know the name of these plants? Have you seen any like them? Where were they growing? Were the flowers the same color as these? What parts of the plant do you see in the picture?" The response should include the stems, leaves, buds, flowers, and seed pods. "What are these plants climbing on? What would happen if there were no fence there for the plants to climb on? What general name do we give to plants that climb?" The pupils who have had *Look and Learn* will say "vines."

"The next part of our book has a story about morning-glories and how they grow." Present the title "Plants" and say, "This part of our book will tell us about other plants, too."

Pages 62-63

Relation to the Unit: To extend the concept presented in *Look and Learn* that living things have certain characteristics that distinguish them from non-living things.

Concepts:

A. Animals are living things.
B. Plants are living things.
C. All living things grow, reproduce, and die.

Information for the Teacher: Things that are alive are distinguished from things that are not alive in the following ways: they eat, grow, breathe, move, produce others like themselves, and die. The meanings most second-grade pupils attach to *eat, breathe,* and *move* are swallow, take air into and expel it from the lungs, and go from place to place. Plants use oxygen and food, too, but the children do not realize this fact. There are also some animals, such as the oyster and the sea anemone, that do not move about except when they are young and free-swimming; but there is no need to bring out exceptions to the general rule at this level. For the purpose of this lesson it is satisfactory to say that all living things are alike in that they grow, reproduce, and die.

Procedure: Present the title "Which Ones Are Alive?" Then, if the classroom has an aquarium, use it and follow the general pattern of the lesson below. If not, use the pictured aquarium in the following way: "Look at the picture at the top of page 62. Which things in the picture are alive? Which are not? Why do you say that the fish are alive?" If this question does not get a response, say, "What can the fish and the snail do that the stones, the sand, and the aquarium itself cannot do?" If the pupils do not include some expression for *reproduce* in their responses, have them turn to the first part of the book, look through the pictures, and note all the baby animals. The pupils will undoubtedly give many characteristics of living things, but emphasis should be placed on growth, reproduction, and death. Say, "How do you know that the plants are alive?"

Now say, "Look at the small pictures on both pages. We are going to make a chart to show how we know whether or not the things pictured on these pages are alive, but first we must answer the same questions about all of them. Do scissors grow? Do they make others like themselves? Do they die?" Continue in the same way with the other pictures.

On the blackboard the teacher may make a chart similar to the following as the children enumerate the things pictured on these pages.

	Does it grow?	Does it have babies or make others like itself?	Does it die?
Scissors	No	No	No
Chicken	Yes	Yes	Yes
Trillium	Yes	Yes	Yes
Squirrel	Yes	Yes	Yes
Wheelbarrow	No	No	No
Corn	Yes	Yes	Yes
Horse	Yes	Yes	Yes
Pan	No	No	No
Dandelion	Yes	Yes	Yes
Gasoline Pump	No	No	No
Dog	Yes	Yes	Yes
Peach Tree	Yes	Yes	Yes
Bird	Yes	Yes	Yes
Tulip	Yes	Yes	Yes
Rubber Tire	No	No	No

The completeness of the chart will be determined by the pupils' background. It may be that the only characteristic common to both plants and animals upon which all children agree will be that of growth, and that is satisfactory at this level. This lesson may be extended by adding the names of other living and non-living things familiar to the pupils.

Extending and Enriching Activities:

1. The chart suggested above may be modified and extended to combine pictures and text. Oak tag may be used. Cut out pictures of animals and plants very common to the locale, such as squirrels and corn, and mount them under the applicable headings. Later, when the children have made the necessary generalizations, animals and plants with which the children have not had direct experience may be added.
2. The furnishings of the classroom may be classified in terms of living and non-living things. Games using the labels *Not Alive, Alive, Animals,* and *Plants* may be played. The pupils should be sure to label plants not only with *Plants* but also with *Alive*, and animals in the room should also receive two labels. Activities such as these help the children perceive that plants and animals are the two major divisions of living things.

Page 64

Relation to the Unit: To extend the concept presented in *Look and Learn* that flower forms have distinguishing features by which we can tell one plant from another.

Concepts:

A. The general shape of the flower may differ.
B. The number of petals may differ.
C. The arrangement of the petals may differ.
D. The shape of the petals may differ.

Information for the Teacher: The flowers shown in the four rows are petunias, narcissus; pansies, rose; cosmos, columbine; nasturtiums, coreopsis. Flowers familiar to the children should be named. Otherwise, it is sufficient for the pupils to designate those that are most alike. During the discussion develop such words as *shape* and *petal.*

Procedure: "Look at the first row of flowers. All of them are different in color; yet three of them have the same name and are like one another in many ways. Can you find the three that are alike? Do you know their name?" Pupils may wonder why the third flower is also a petunia, since it differs somewhat from the first two flowers. In order to elicit that there may be many varieties of petunias, just as there are many kinds of roses, tulips, etc. ask, "Are the petals on all roses or tulips just alike? Do you know the name of the flower in this row that is not a petunia? How is the narcissus different from the petunias? In what ways besides color are the three petunias different?" Lead the pupils to see that they differ in size, and shape of petals and in markings.

Continue with the other rows, having the pupils note that, while three of the flowers in each row may differ in color, marking, and details of shape, they are more like one another than like the odd one.

Extending and Enriching Activities:

1. The pupils should be encouraged to bring in flowers and compare them, noting relative sizes, number of petals, petal arrangement, texture, odor, etc. These flowers may be pressed and later mounted on dark craft paper and labeled.
2. Encourage pupils to bring in catalogues and make charts of common flowers.

3. Make a flower calendar and mount pictures of plants as they are observed in bloom.
4. If it is at all possible, school gardens should be arranged for; and it is usually satisfactory to devote half the plot to flowers. These, of course, should be rapidly growing annuals so that the pupils can actually see their flowers in bloom before school closes for the summer. Local florists will advise the class about plants best suited to the climate, locality, etc.
5. List the flowering plants that grow on the school grounds.

Page 65

Relation to the Unit: To develop the concept that the leaf structures of plants have distinguishing features by which we can tell one plant from another.

Concepts:

A. The general shape of the leaf may differ.
B. The type of edges may differ.
C. The arrangement and type of veins may differ.

Information for the Teacher: Leaves such as those of the poplar, which are "one piece," are called *simple;* those of the horse chestnut, which are made up of leaflets, *compound;* those of the sugar maple, which have divided edges, are called *lobed;* those of the elm, which have toothed margins, *serrated;* and those of the lilac, which have smooth margins, *entire.* The above italicized terms are not taught, however, at this level.

The teacher must be careful not to generalize that all trees with needle-shaped leaves are evergreens. Neither should she state that all evergreens have needle-shaped leaves nor that all broad-leaved trees lose their leaves in winter.

The leaves used on this page have been selected so that several will be common to most localities. These leaves should be identified and named. They are sugar maple, elm, horse chestnut, sugar maple; white ash, peach, white ash, white oak; poplar, goldskin willow, poplar, box elder; white pine, spruce, white pine, hemlock.

During the discussion develop such words as *edge, leaflet, vein, stem, needle, twig,* etc.

Procedure: Before making a detailed study of the page, ask the pupils whether they have seen any leaves like these, and whether they know the names of the trees from which the leaves came.

Then say, "Look at the first leaf in the first row. There is another leaf in this row that came from the same tree and is the same shape. Find it. Is it exactly like the first leaf? How did you know it came from the same tree? Now look at the second leaf in the first row. How are the edges of this second leaf different from those of the first leaf? Look at the third leaf in this row. It looks as though it were many leaves, but really it is just one leaf. How many parts are there to this leaf? These parts are called leaflets because they look like little leaves."

Tell the pupils that the lines in the leaf are the veins that carry water and food to it. "How are the veins in the second leaf different from those in the first leaf?" Have the pupils trace the main veins and side veins with their forefingers.

Now direct the children to look at the first leaf in the second row. Tell them that it has many leaflets, just like the third leaf in the row above, but that it, too, is only one leaf. Be sure that the children understand this point. "Find another leaf in this row that is like the first one. How are the edges of these leaves different from the edges of the leaves in the row above? Look at the last leaf in the second row. Is there a leaf in the first row that has edges something like those of this leaf? How are the second leaves in each of these rows alike? How are they different?" While pupils at this level cannot be expected to understand such terms as *serrated, lobed,* etc., most children will use highly descriptive language in distinguishing different types of edges. Such terms as *cut out with a saw, saw marks, nibbled, little teeth marks,* etc., are acceptable for *serrated; big bites, torn out as we tear paper pictures, cut out with big scissors,* etc., are acceptable for *lobed.*

Continue with the third row, having the pupils find the two leaves that are alike and tell in what ways they are alike and in what ways they are different from the other leaves in the row.

Have the children reëxamine the first three rows and find (1) the leaves that have leaflets,

(2) the leaves that have smooth edges, (3) the leaves that have little teeth marks or saw marks in the edges, (4) the leaves that have big bites out of the edges, and (5) leaves and leaflets with one heavy vein.

Before proceeding to the last row, help the children generalize that they can distinguish many leaves by asking, "What three things can we look for to help us tell one leaf from another?

"Now look at the last row. We call these *needles*, but they are leaves, too." Continue with this row, helping the pupils see that some needles, such as the white pine, grow in groups, or bunches; some, such as the spruce, grow all around the twig; and others, such as the hemlock, grow on two sides of the twig. The children should also note that some needles are long and slender, while others are short and blunt.

Then ask, "How are the leaves in this row different from the leaves in the row above?" Responses should include the facts that these leaves (needles) are thicker and narrower, that the veins cannot be seen, and that many of these leaves remain on the trees all winter.

Extending and Enriching Activities:

1. Make leaf collections from trees native to the locality. These can be pressed and mounted on sheets of paper, used in leaf books, etc. The leaves should be labeled.
2. The children can be encouraged to observe trees rather than individual leaves by making tree pages. Such pages include a drawing of the tree to indicate its general shape; simple descriptive text about height, thickness of trunk, type of bark, etc.; and a mounted leaf.
3. To focus attention on leaf shapes, it is often helpful to make leaf plaques. (See Appendix, page 62.)
4. Investigate and discuss the uses of trees. Children who live near rivers that sometimes flood can be led to see that plantings of trees with spreading roots, such as the goldskin willow, help hold the soil against the action of the water. Similar uses specific to the locality should be stressed.

Pages 66-67

Relation to the Unit: To extend the idea that plants have characteristic distinguishing features; to give practice in comparing and contrasting.

Information for the Teacher: The plants shown on page 66 are red clover, white clover, alfalfa; tulip, iris, mullein; violet, trillium, viola; carnation, lily, swampcandle. The plants on page 67 are mountain laurel, currant, holly; trumpet-creeper, cranberry, Virginia creeper; magnolia, dogwood, tulip tree; dahlia, azalea, hollyhock.

When the name of a plant is familiar, it should be used, but it is not the purpose of the page to teach plant identification.

Procedure: Have the children turn to pages 66 and 67 and then say, "When we look at flowering plants, we are often so used to telling them apart by the flowers that we forget to look at the rest of the plant. Glance quickly at the first plant in the first row. Now look away from it. Who can tell me what the name of the plant is?" Be sure that the children reply that it is red clover, as there are many varieties of clover. "What color were the flowers? Can you describe the flower?

"How much can you tell about the leaves, without looking at the picture again? You see, we didn't pay much attention to the leaves, although the leaves of the red clover are quite different from those of other plants. Look at the first row of pictures. There is another red clover plant in the row. It has no flowers. Can you find it? How did you know that the last plant in the row is also a red clover? How are its leaves like those on the flowering red clover plant?

"Now look at the other two plants in the row. In some ways the leaves are much like those of the red clover. How are they like the red clover? How are they different?"

Proceed in the same way with the remaining rows. Stress the fact that flower forms are not the sole way of distinguishing one plant from another. In the leaf comparison focus the pupils' attention on general shape, width, length, shade of green, etc., and on such characteristics as were presented in connection with the tree-leaf study on page 65: leaf edges, type of leaf, vein arrangement, etc.

Extending and Enriching Activities:

1. Play games that involve matching activities similar to those on pages 66-67.

2. If the season permits, bring leaf specimens of common flowering plants into the classroom to analyze and compare them.
3. Extend the work of plant comparison to root structure. If possible, use some actual specimens, although pictures can be used to good advantage. Fleshy taproots, long taproots, spreading roots, etc., may be presented.

Pages 68-69

Relation to the Unit: To extend the concept presented in *Look and Learn* that plants follow a definite pattern of growth; to introduce in story form the idea that plants must have light, water, and heat in order to grow.

Concepts:

A. Most plants grow from seed.
B. When these plants mature, they bear flowers.
C. The flowers of these plants produce seeds.
D. The seeds produce the same kind of plant as the parent plant.
E. Some plants live only a year.
F. Plants require various amounts of time for each period of growth.

Information for the Teacher: Before this lesson is presented, soak large seeds, such as Lima beans or marrowfat peas, overnight. (See Appendix, page 61.) Show the pupils the seed structure, pointing out the minute plant and the food stored for its use. (See Appendix, page 62.) Also soak morning-glory seeds. It is advisable to notch these or to soak them for a longer interval. Demonstrate that the roots of plants always grow downward. (See Appendix, page 62.)

Replies to questions should not be forced, as many of the concepts introduced will be further developed in later pages.

During the discussion develop such words as *seed, sprout, root, vine, stem, bud, seed pod,* etc.

Procedure: Have the pupils turn to the unit title page (page 61); then ask such questions as: "Did you ever plant morning-glories? What do morning-glory seeds look like? How long do morning-glory plants live?" Then say, "Today we are going to find out the answers to these questions."

Direct the pupils to look at the first picture in the sequence. Say, "The little girl is planting morning-glory seeds like the ones in the circle. In what season do we plant morning-glories? What kind of weather do we usually have then? Where might she have got the seeds? She planted the seeds where the ground would get plenty of sunshine. Can you tell the reason why she did this? What else must she do to get the plants started besides put them in the soil?"

At this point allow the children to examine the presoaked seeds. Elicit that water helps soften the hard seed coat so that it will split open easily. Show the pupils that water softens the morning-glory seeds in the same way. Have the children examine the close-up in the first picture and compare the seeds shown there with those that have been soaked in water.

"What has happened to the seeds in the second picture? What parts of the plant do you see above the ground? If the little girl were to dig up one of the plants, what part of it would she find growing in the soil?" Tell the children that one or more weeks are required for the seeds to sprout, or come up.

"What is the little girl doing in the third picture? Why?" Elicit that the morning-glories are vines and would become tangled if they had nothing on which to climb. "How do morning-glories climb?" Have the pupils refer to page 61 to see that the stems of the morning-glories twine.

"How are the plants in the fourth picture different from those in the third picture?

"Look at the fifth picture. What new parts of the plant do you see now? Does anyone know in which months morning-glories bloom?" (From June to September.) "Turn back to page 61 and look at the lower part of the picture. What do the buds of the morning-glory look like? What time of day do the flowers open?" Develop the idea that several weeks of growth are required after the first leaves appear before the plants bloom.

"In the sixth picture what has happened to the flowers? (petals fallen, seed pods formed) How have the leaves changed? What do you think has made them change color? (frost) What season of the year do you think it is? What new part of the plant do you see under the magnifying glass? Where did the seed pods and seeds come from? (flowers) What color are the pods? When seed pods are brown and dry, we say that they are ripe. What is falling from one of the ripe pods? What kind of plant do you think that seed will make?

"Are the plants in the seventh picture alive?" Bring out the fact that not even the roots are alive and that the snow and high winds have torn down most of the dead leaves and stems.

"What season do you think it is in the last picture? Do you think the little girl planted these morning-glories? Why not?" (Uneven rows and scattered plants indicate that these plants grew from the seeds dropped the preceding autumn.) "Do you think that all the seeds that fell in autumn grew to be new morning-glory plants? Why not?" Responses should include the ideas that conditions were not so good as when the soil was prepared, the seeds were covered, and they received water when needed.

Extending and Enriching Activities:

1. Raise morning-glories in the school window box so that the pupils will be able to watch their development. Much better results will be gained if a small notch is filed in each seed before planting.
2. Using seeds, young seedlings, pictures from garden catalogues, etc., as models, make picture charts of life cycles of other flowering plants.
3. Plant various seeds in flats or pots and note the different time intervals from planting to the appearance of the first two leaves and to the appearance of true leaves. The children should understand from this work that various amounts of time are required for germination and growth from stage to stage. (See Appendix, page 62.)
4. If the season will permit outdoor use later, transplant seedlings (usually when four true leaves appear) to stand three inches apart. Show the children the root structures.
5. Remove a mature plant from the soil to observe the root structure. (This can usually be done without damage to the plant if it is promptly replanted and watered.)

Page 70

Relation to the Unit: To determine the pupils' understanding of the fundamental concepts of plant growth; to promote ability to observe accurately and to perceive the sequent nature of growth and reproduction.

Procedure: "These six pictures tell the story of another plant that grew up. Do you know the plant's name?" Tell the children that the pictures are not arranged in the right order, but that the series begins with the picture in the upper left-hand corner and ends with the one in the lower right-hand corner. Have them indicate the correct sequence of the pictures and cite evidence for it. If any pupil has difficulty in determining the sequence, refer him to the life cycle of the morning-glory on pages 68-69.

If desired, point out that in the case of the morning-glory the seeds merely fell from the ripe seed pod, whereas in the sweet pea they "pop out."

Values of the page may be extended by asking, "Do any of you have sweet peas growing in your own gardens? Did they grow better in a sunny or a shady spot? How high did the plants grow? Did they need something to climb on? What are plants like the morning-glory and the sweet pea called? Were all the blossoms the same color? Why do you think so many people raise sweet peas in their gardens?" Attention may be called to the tendrils shown in pictures 2, 5, and 6 and their relation to the climbing habit discussed. Explain that morning-glories (see page 61) lack tendrils but climb by the turning of the stems themselves.

Extending and Enriching Activities:

1. Continue the work in life cycles of plants begun in connection with the previous lesson.
2. If the children were interested in the function of tendrils, continue the discussion of various vines and their methods of climbing.

Page 71

Relation to the Unit: To compare and contrast seeds of plants; to extend and summarize methods of distinguishing between plants.

Concepts:

A. Plants may differ in the color and shape of their seeds.
B. They may differ in the kind of seed container produced.

Information for the Teacher: The plants shown on this page are morning-glory, nasturtium, petunia; dandelion, milkweed, thistle; apple, peach, cherry.

Procedure: Follow the plan suggested for pages 66-67, and elicit the likenesses and differences in the flowers and leaves of the first three plants on page 71. Then ask, "Can you see in the picture still another part that helps us know what kind of plant each one is?" When the pupils give the response *seeds*, ask them to tell in what ways the seeds of the three plants are alike and in what ways they are different. Bring out the idea that the seeds are alike in that they grow where the flowers were and contain a tiny plant which will produce the same kind of plant as the parent, and that they are different in that the seed containers of each vary in size, shape, and color.

Continue with the next two rows in the same manner, bringing out the likenesses and differences in the flowers, leaves, and seeds.

Extending and Enriching Activities:

1. Make collections of available local seeds. If the season does not permit, inexpensive seed packets can usually be purchased. Individual seeds can be placed in small cellophane envelopes, and these mounted and labeled.
2. Make posters of local flowers. Each poster should consist of drawn or cut-out pictures of a flower and its leaves, buds, seed pods, etc. Put the corresponding seeds in a cellophane or glassine envelope and paste the envelope on the poster.

Page 72

Relation to the Unit: To present various natural means of seed dispersal; to develop ability to compare and contrast.

Concepts:

A. Some seeds have stiff sails and ride in the wind.
B. Some are heavy and merely fall to the ground.
C. Some have hooks or barbs that fasten on moving objects.
D. Some have fluff attached and float in the air.
E. Some are contained in edible fruits and are distributed when man and animals eat the fruit.

Information for the Teacher: The seeds shown on this page are maple, elm, oak, box elder; Spanish needle, poppy, sticktight, cocklebur; willow, cottonwood, violet, cattail; milkweed, plum, pear, orange.

Procedure: Have the children turn back to pages 68-69. Say, "What is the girl doing in the first picture? Yes, she is planting morning-glory seeds. Now look at the last picture on page 69. Did she plant those seeds? Did anybody? How did they get in the soil? When we plan a garden, how do we plant the seeds?" Responses should include the ideas that we plant seeds in such a way as to get the kinds of plants we want in the spots we have selected for them; and that, if allowed to go to seed, plants seed themselves.

Say, "There are many ways in which seeds are planted. Do you remember a seed that pops out of its pod and falls to the ground?" Call the pupils' attention to the sweet pea on page 70. "Do you know any other seeds that fall out or are popped out of their seed pods and fall to the ground?

"Do you think the wind could have anything to do with scattering seeds?" Call attention to the glider and the kite on page 57, and discuss the way they ride on the wind. Add that perhaps some seeds can ride on the wind, too.

Have the children turn to page 72. Say, "In the first row there are three kinds of seeds that ride on the wind as a kite or glider does. Can you find them?" Have the children justify their selection and elicit that these seeds have wings that ride the wind. If possible, bring a winged seed into the classroom and demonstrate the function of the stiff wing. If specimens cannot be obtained, tell the children about the wing construction. Say, "Which seed in the first row is not a glider? Do you know its name? Why are you sure that an acorn is not a glider as the other three are? What happens to the acorn when it is ripe?" Elicit that it, like the morning-glory, falls. "Sometimes acorns are planted a long way from the oak tree after they fall. Do you know what plants them?" Elicit that squirrels often bury acorns for their winter food and do not find them again.

"In the second row there are three other kinds of seeds that, like the acorn, are often carried long distances. They are accidentally given rides by people and animals, but the people and animals do not want to eat them. The first plant in the row shows seeds that steal rides. How do you think they steal rides?" Pupils should note that the Spanish needle has sharp hooks and barbs that can hook into clothing or fur of animals. "Can you find two other kinds of seeds in this row that steal rides?" Have the pupils justify their choices.

"Look at the third row. Can you find three kinds of seeds that look like one another? How are they alike? Do you think that these small seeds that are attached to bits of fluff are very heavy? Could they float in the air? How do you think seeds like these might be scattered?" If the children hesitate, demonstrate with a feather or a small piece of cotton. "Look at page 71 and see if you can find other seeds that float through the air on fluff. Yes, the dandelion, milkweed, and thistle seeds also have fluff. Now turn again to page 72. How do you think the other seed in the third row is planted?" Tell the children that the seed case of the violet, when mature, snaps open and the seeds, like those of the sweet pea, are popped out into the air.

Call attention to the last row and say, "Three of the seeds in this row pay for their rides by being inside something that is good to eat. Which ones are they? How does the other seed travel? What other kinds of seeds do you know that pay for their rides?" Explain that, when fruits are eaten, the seeds are often discarded a considerable distance from the parent tree and may, under favorable circumstances, germinate and produce new plants.

It should be made clear to the children that although all seeds do not germinate, more hand-planted seeds will germinate and mature than naturally scattered seeds, since hand-planted seeds are assured of relatively fertile soil, moisture, and cultivation.

Summarize the page by asking such questions as "Which seeds could be called gliders? Why? Which seeds could be called floaters because they ride on the wind in another way? Which seeds could be called hitchhikers because they steal rides? Which seeds pay for their rides? Do seeds have to be planted by people in order to grow? What did we find out about ways in which seeds may be scattered?"

Extending and Enriching Activities:

1. Encourage the children to start collecting seeds of all kinds. When the collection is completed, have the children divide the seeds into the following groups: (a) those that glide through the air, (b) those that catch rides on people or animals, (c) those that float on the wind, and (d) those that pay for their rides by being in something good to eat. Put the seeds in cellophane or glassine envelopes. Make a bulletin-board display by pasting the envelopes on large sheets of tag board appropriately headed.
2. Many plants living in or near water produce seeds adapted to water dispersal. These may be presented and discussed, but they will probably be of interest only to children familiar with water plants.
3. Make up stories about the trips of various seeds. Such stories might trace the life cycle of the plant, tell how the seeds were scattered, and which ones germinated and grew into mature plants.
4. Problems such as the following may be posed to illustrate the high mortality of naturally scattered seeds:

   Four seeds blew away from a maple tree at the same time. They rode in the wind; and, when the wind stopped, one glided down onto a highway. The second fell into a vegetable garden. The third glided down on top of an automobile, and the fourth landed in a crack in the sidewalk. Which seed do you think is most likely to sprout? Which one is least likely to sprout and grow?

Page 73

Relation to the Unit: To demonstrate that water is necessary for plant growth; to present further work in the technique of experimentation.

Concepts:

A. Seeds need moisture in order to germinate and grow.
B. Plants die without moisture.

Information for the Teacher: Careful attention should be given not only to the science concepts but also to the technique of experimentation.

Before the page is begun, be sure that the materials shown will be available. It is usually wise to have several similar experiments done by different groups. Sunflower seeds are used in the pictured experiment because they germinate within two or three days. Any large seed that the teacher knows will sprout quickly could be used instead.

During the discussion, develop such words as *experiment*, *sprout*, *roots*, *stem*, *first leaves*, etc.

Procedure: Tell the pupils that the girl in the picture wanted to find the answer to the question at the top of the page. Read the title "Do Plants and Seeds Need Water?" and say, "The pictures tell us about the experiment she did in order to find out whether sunflower seeds need water to sprout and grow.

"What is the first thing she did?" (She put a long ribbon of cotton around the edge and down to the bottom of each glass, after having thoroughly moistened the cotton for two of the glasses.) "Then what did she do?" (She put four sunflower seeds on top of the cotton around the edge of each glass.) "What was the next thing she did?" (She poured water into the two glasses having the moistened cotton.) "Do you think that the cotton on the rims of these two glasses will stay wet?" If the children hesitate at all in answering, demonstrate how the water is soaked up into the cotton by putting one end of a ribbon of cotton into a glass of water and letting the other end hang outside. Have the children see that after a few moments the moisture reaches to the very end of the cotton ribbon outside the glass. "Would the seeds that the girl put on the cotton on these glasses get wet, too? Why?

"Now look at picture 2. What has happened to each set of seeds? Which ones sprouted and grew?" Have the pupils observe the leaves, stems, and roots. Explain that many small, fine roots grow from the main root, and that the main root, instead of growing down into the water, may be held in the cotton by these small roots. "What did the seeds have that helped them grow? Did all the seeds on the glasses containing water grow?" The pupils should note that all seeds do not germinate.

"Then the girl wanted to find out if the plants would keep on growing if she took the water away. What is she doing in picture 3? After a few days the plants looked the way you see them in the last picture. What has happened to those in the glass with water? What has happened to the others? What does this show? Can you tell why she left the water in one glass?"

Summary: "Through her experiment what did the girl learn that seeds must have in order to sprout? Which picture shows you this? What did she learn that plants must have to keep them growing? Which picture shows you this?" Elicit that the girl really knows the answer to her questions because she has tried to grow the plants in two ways—with water and without water—and has seen what happened.

"Do you think these plants, if they were kept in just a glass of water, would continue to grow and become large plants?" Elicit the pupils' opinions on this, but do not settle the question, since they will be able to answer it themselves by carrying out the experiment suggested below.

"Perhaps you would like to do this experiment here in the schoolroom. What things shall we need?" Help the children assemble materials. With the first picture as a guide, set up experiments and put the glasses where they will not be disturbed. Replenish the water as needed. The children may be interested in keeping a record of such items as:

Number of seeds used for the experiment
Number of days required for seeds to sprout
Number of seeds that sprouted
Part that grew first
Number of days required for first leaves to appear
Number of days required for plant to wilt and die after water was removed
Number of days plants lived in water

When the experiment has been completed, review the problem, the materials, the procedure, the results, and the conclusion.

Page 74

Relation to the Unit: To demonstrate that light is necessary for plant growth.

Concepts:

A. Most plants stop growing after a time unless light is present.

B. These plants do not stay green unless light is present.
C. Plants that have been excluded from the light and have turned yellow will turn green again when they are exposed to the light, provided they are still alive.
D. These plants eventually die if deprived of light for too long a time.

Information for the Teacher: The value of the lesson will be greatly increased if the pupils duplicate the experiment. However, the experiment must be carried on over a fairly long time interval (with some plants as long as a month); and so, if preferred, deductions can be made from the pictures alone. If at all possible, the experiment should be duplicated; and it is suggested that healthy young plants, such as petunias, pansies, etc., be used. The local florist or nurseryman will usually be glad to furnish stock that is near the budding stage.

Procedure: Before distributing the books say, "If you wanted to make sure that plants needed light in order to grow, what would you do?" If the children haven't any ideas, recall the experiment showing that plants need water. "Yes, perhaps we could plan an experiment that would prove whether plants need light to grow."

Distribute the books and have the pupils turn to page 74. Ask them if they know what kind of plant is growing in the two pots. If they do not know, tell them that the plants are narcissi, or paper-whites, according to the more common local name. Read the title and elicit that this is the question the boy is going to answer experimentally. Call the pupils' attention to the fact that the boy has two plants. Then ask, "What is he going to do with one of them? What will covering it with a box do? Yes, the plant will get no light. What will happen to the plant that is covered with the box if it is true that plants need light in order to grow?"

After directing the children's attention to the second picture, ask, "Is the plant dead yet? Do you think the boy took the box off the very next day? How do you know he didn't?" Pupils should note that the plants have grown enough to indicate that there is a fairly large time interval between pictures 1 and 2. "How are the plants different now?"

Have the children look at the third picture. Ask, "What has happened to the covered plant now? What has happened to the other one?

"The covered plant in the fourth picture is not dead, but what has happened to it? What has happened to the other one? What color do plants become when they have been kept from the light? What do you think will happen if this yellow, wilted plant is left out in the light?" (Since it is not dead, it will revive and turn green.)

Summarize the discussion by asking, "Did the boy find out whether plants need light? What happened to the plant that had no light?" Be sure the pupils understand that the plant without light turned yellow and did not reach maturity and would eventually die if deprived of light for too long a time.

If it is at all possible to duplicate the experiment, say, "Suppose we do this experiment, too. What do we need? What shall we do? Shall we water our plants?" Explain that the experiment is based solely upon the exclusion of light, and so the plants should receive other normal care.

Set up the experiment, using several pairs of plants for various groups. Exclude light in various ways: by covering with boxes, putting in a dark closet, etc. The children should note:

The relative size of the plants at the beginning of the experiment
The number of days that pass before the covered plant begins to lose color
The number of days that pass before the uncovered plant develops buds and whether or not the covered plant develops buds
The height to which the plants grow
The number of days that pass before the covered plant begins to lie back
Whether the covered plant eventually dies

Extending and Enriching Activities:

1. Have the children tell about or find examples of plants that have turned yellow because of insufficient light. These might include house plants left in a north window in winter, onion sprouts left in the basement, etc.
2. If the season permits, cover a growing plant in the garden. A flowerpot, a cone of paper, etc., may be used. Note what happens.
3. Cover grass with a plank or leave a basket on the grass. Note how long it takes for the

grass to start turning yellow. Remove the plank or basket and see what happens.

4. Play games and pose problems that stress the need of plants for light.

Page 75

Relation to the Unit: To check pupils' understanding of the concepts developed on pages 73 and 74; to promote ability to infer cause-effect relationships.

Procedure: "Look at the first picture in the top row. Do you know the name of the young plants that are being set out?" (Tomato.) "Why are they drooping?" (They have been out of the earth and have had no water for a time.) "Now look at the next picture. What is happening? What do you think will happen to the plants?" (They will stand up straight and grow again.)

"Describe the grass you see in the first picture of the second row. What is the little girl doing in the second picture? Why do you think she is putting tar paper over one part of the grass? What will happen to the grass under the paper if the paper is left there long enough? Yes, it will become yellow and limp. Why? If the paper is left for a still longer time, what will happen? Yes, the grass will die. Why?

"What is lying on the grass in the first picture in the last row? When the little girl lifts the board, what does she find has happened to the grass underneath it? Why? If the board is left there too long, what will happen to the grass?

"The grass under the board is not dead. If the girl takes the board off the grass, what do you think will happen?: (The grass will become green and soon will be healthy-looking and strong again.)

Extending and Enriching Activities:

1. Transplant two groups of seedlings (any variety will do, provided they have reached the four-leaf stage) to two flats of dry soil. Water one flat. Do not water the other. Observe the results.
2. Duplicate the activities shown in rows 2 and 3. Use tar paper, or roofing paper, asphalt shingling, etc. Cover grass with paper until grass turns yellow (this usually requires several days). Remove one piece of tar paper and observe the changes that take place. Leave the other piece of paper on the grass until the grass is dead.
3. Summarize what has been learned regarding plant growth. Indicate which facts were determined experimentally and discuss the value of experimentation.

Pages 76-77

Relation to the Unit: To show how animals and man aid in the distribution of seeds.

Procedure: Tell the children that the eight pictures present a story. Then guide them through the picture sequence by asking, "What is the name of the plant shown in the first picture?" If no one knows, tell the children that it is a burdock. Then say, "What are the brown things on the plant? What do you see all over the outside of these seeds or burs? Have we seen burs like this on another page in our book?" Page 72 gives a detailed picture of the cocklebur. "What did we find out about cockleburs when we studied page 72?

"What has happened in the second picture? What is the puppy trying to do? Why can't he get the bur out? Where do you think he is going in the third picture? How does he show the little boy what is wrong? Why can't the boy get the bur out alone? What does the father do in the sixth picture? Why does he give the bur to the boy? What does the boy do with it?" Throughout the questions bring out the fact that, because of the stickers on the bur, the plant becomes propagated in entirely different surroundings. Stress the fact that there is high mortality in naturally-sown seeds—the wind carries them to gutters and drains, to paved streets where they are crushed, etc.

Extending and Enriching Activities:

1. Have the children bring in various kinds of seeds adapted by nature for hooking rides, like the cocklebur in the lesson. Allow the pupils to take the seeds in their hands and feel the rough barbs on the seed coats. This will help them understand why seeds of this type adhere easily to everything passing by.
2. Make a bulletin-board display by mounting a piece of soft flannel or wool material on a sheet of tag board and placing the seeds on the cloth. Let the children see how difficult it is to detach the seeds.

Bibliography for *All Around Us*

Allen, Gertrude E. *Everyday Birds.* Boston: Houghton Mifflin Company, 1943.
Attractive crayon drawings showing robin, chickadee, woodpecker, crow, duck, and wren. Text suitable for reading to children.

Bauer, Mary Jean. *Animal Babies.* Chicago: M. A. Donohue & Company, 1949.
Twelve excellent, full-color illustrations that children will enjoy looking at.

Beauchamp, W. L.; Melrose, Mary; and Blough, G. O. *Discovering Our World,* Books One, Two, and Three. Chicago: Scott, Foresman and Company, 1947.
Helpful science textbooks for the teacher, with explanations for many of the questions that the children might ask.

Bridges, William, and Holisher, Desider. *Big Zoo.* New York: The Viking Press, Inc., 1941.
Photographs of animals in the Bronx Zoo and the story of their care.

Bronson, Wilfrid S. *The Wonder World of Ants.* New York: Harcourt, Brace and Company, Inc., 1937.
Excellent pictures of ants and their colonies. Information adapted for retelling by teacher.

————————. *Hooker's Holiday.* New York: Harcourt, Brace and Company, Inc., 1944.
Large black and white illustrations with very little text. A humorous story of a monkey's adventures in a museum.

————————. *Turtles.* New York: Harcourt, Brace and Company, Inc., 1945.
Good illustrations and large type. Accurate text matter with humorous treatment.

Buff, Mary and Conrad. *Dash and Dart.* New York: The Viking Press, Inc., 1942.
Presentation of the lives of two fawns. Many illustrations.

Comstock, Anna Botsford. *Handbook of Nature Study.* Ithaca: Comstock Publishing Company, 1939.
Reference book in nature study for the teacher. Contains many suggestions for science activities.

Craig, Gerald S. *Science for the Elementary-School Teacher.* Boston: Ginn and Company, 1940.
General science textbook, containing suggestions and information for the teacher.

Encyclopaedia Britannica Press. *Encyclopaedia Britannica Picture Stories.* Chicago.
A series of twelve pamphlets. Each contains excellent, large photographs of animals in natural, real-life situations.

Erickson, Phoebe. *Cattail House.* Chicago: Childrens Press, 1949.
An excellent book to illustrate concepts dealing with animal homes and feeding habits. Large pictures and text that may be read to children.

Flack, Marjorie. *The Boats on the River.* New York: The Viking Press, 1946.
Large four-color illustrations of boats, with and without engines.

FLORY, ARTHUR. *Where Are the Apples?* New York: Elliot, 1945.
Legend-type text and four-color illustrations tell the story of an apple tree from the first bud to the ripe apple.

FRISKEY, MARGARET. *Johnny and the Monarch.* Chicago: Childrens Press, 1946.
Interesting and informative book about butterflies. May be read to children.

GAER, JOSEPH. *Everybody's Weather.* Philadelphia: J. B. Lippincott Company, 1944.
Good reference for teacher. Parts suitable for reading in answer to pupil's questions.

GAUL, ALBRO T. *Picture Book of Insects.* New York: Lothrop, Lee & Shepard Co., 1943.
Photographs of many common insects, with informational text.

HADER, BERTA and ELMER. *The Big Snow.* New York: The Macmillan Company, 1948.
Large illustrations. A fanciful text that may be read to pupils.

HEILE, MARYANNE. *The World's Moods.* Chicago: Follett Publishing Company, 1930.
Informational material for the teacher. Questions that children might ask are placed in margins. Explanations easily understandable.

HENRY, MARGUERITE. *Birds At Home.* Chicago: M. A. Donohue & Company, 1942.
Excellent colored pictures of common birds. Text for the teacher's use.

HUMPHREYS, DENA. *The Zoo Book.* New York: Henry Holt & Company, 1947.
Large photographs. Text definitely for primary-school children. Will answer many of their questions.

HUNTINGTON, HARRIET E. *Let's Go Outdoors.* Garden City, New York: Doubleday, Doran and Company, Inc., 1939.
Especially good photographs of living creatures within every child's experience.

————————. *Let's Go to the Seashore.* Garden City, New York: Doubleday, Doran and Company, Inc., 1941.
Photographic illustrations of the plants and animals a child would see at the seashore. Simple, interesting text.

KANE, HENRY B. *The Tale of the Bullfrog.* New York: Alfred A. Knopf, Inc., 1941.
Charming book with outstanding photographs. Story well adapted for retelling by the teacher. This and the following books by Kane would be valuable additions to the room library.

————————. *The Tale of the Crow.* New York: Alfred A. Knopf, Inc., 1943.

————————. *The Tale of the Promethea Moth.* New York: Alfred A. Knopf, Inc., 1942.

————————. *The Tale of the White-faced Hornet.* New York: Alfred A. Knopf, Inc., 1943.

————————. *The Tale of the Whitefoot Mouse.* New York: Alfred A. Knopf, Inc., 1940.

KIERAN, JOHN. *An Introduction to Birds.* Garden City, New York: Garden City Publishing Company, 1950.
Apt and entertaining descriptions of common North American birds. Colored illustrations.

Krauss, Ruth. *The Carrot Seed.* New York: Harper and Brothers, 1945.
A picture book that tells the story of a little boy who plants a carrot seed and waits and waits for it to come up. Finally it does.

————————. *The Growing Story.* New York: Harper and Brothers, 1947.
Excellent supplementary material on the way things mature through the seasons and how a small boy grows. Pictures.

Lenski, Lois. *The Little Auto.* New York: Oxford University Press, 1943.
Two color pictures and explanatory text show how Mr. Small uses and takes care of his car.

————————. *Now It's Fall.* New York: Oxford University Press, 1948.
Both this and the following book illustrate the concept that seasons have characteristic weather and activities. Good for reading to pupils. Pictures catch spirit of the season.

————————. *Spring Is Here.* New York: Oxford University Press, 1945.

Limbach, Russell T. *American Trees.* New York: Random House, Inc., 1942.
Reference book for the teacher.

Mathews, Virginia. *Stop-Look-Listen.* New York: Hampton Publishing Company, 1945.
Large four-color illustrations of various forms of mechanized transportation.

Matschat, Cecile Hulse. *American Butterflies and Moths.* New York: Random House, Inc., 1942.
Beautiful colored illustrations. A scientific text for teachers.

McClung, Robert M. *Ruby Throat.* New York: William Morrow & Company, 1950.
Accurate colored illustrations of a humming bird. Story of the bird's life from egg to maturity. Advanced second-graders could read the text.

————————. *Sphinx, The Story of a Caterpillar.* New York: William Morrow & Company, 1949.
Life cycle of a moth. Clear, colored pictures. Text suitable for reading to pupils.

McIntire, Alta. *Stepladder Babies.* Chicago: Wilcox and Follett, 1946.
Large four-color illustrations with informative text about a robin family.

McKenny, Margaret, and Johnston, Edith F. *A Book of Garden Flowers.* New York: The Macmillan Company, 1941.
Full-color pictures accompanied by informal descriptive text for the teacher.

————————. *A Book of Wayside Fruits.* New York: The Macmillan Company, 1945.
Same as the preceding.

Mitchell, Lucy Sprague. *A Year In the City.* New York: Simon and Schuster, 1948.
Illustrates the activities in the city characteristic of each of the four seasons.

————————. *A Year on the Farm.* New York: Simon and Schuster, 1947
Activities during each of the four seasons on the farm.

Morgan, Alfred. *A Pet Book for Boys and Girls.* New York: Charles Scribner's Sons, 1949.
A good reference for the teacher on animal shelters and habitats.

National Association of Audubon Societies. *Educational leaflets.* New York.
A list giving the titles of informational leaflets (including full-color pictures of birds) that are prepared for school use.

National Audubon Society. *Audubon Nature Bulletin.* (Formerly *School Nature League Bulletins.*)
A monthly nature pamphlet for schools. Articles on mammals, insects, plants, the earth, the sky, and nature crafts.

Pickwell, Gayle. *Weather.* New York: McGraw-Hill Book Company, Inc., 1938.
The story of weather, presented without the use of scientific terms. Helpful information for the teacher's use. Many full-page illustrations.

Pistorius, Anna. *What Animal Is It?* Chicago: Wilcox and Follett, 1947.
Excellent pictures. If the pupils ask, the brief descriptive text may be read to the class.

——————. *What Bird Is It?* Chicago: Wilcox and Follett, 1945.
Picture reference book the children may examine. Text may be read to the class.

——————. *What Butterfly Is It?* Chicago: Wilcox and Follett, 1949.
Excellent pictures. Descriptive text may be read to the pupils.

——————. *What Wildflower Is It?* Chicago: Wilcox and Follett, 1950.
Excellent colored pictures. Good reference book. May be read to the pupils.

Pratten, Albra. *Winkie, The Grey Squirrel.* New York: Oxford University Press, 1950.
Story of the growth and development of a pet squirrel. Interesting, humorous story that pupils will enjoy hearing. Full-page colored pictures every other page.

Proctor, G. D.; Grossman, Helen; and Freegood, Seymour. *A Picture Book of Nature.* Garden City, New York: Garden City Publishing Company, 1943.
Black-and-white illustrations of common birds, mammals, fish, reptiles, insects, etc. Simple and interesting text for teacher's use.

Robinson, Irene. *Picture Book of Animal Babies.* New York: The Macmillan Company, 1948.
Black-and-white and colored pictures, all of mother and animal babies. Simple text.

Rojankovsky, Feodor. (Illustrator) *The Great Big Animal Book.* (Big Golden Book) New York: Simon & Schuster, 1950.
Large colored pictures of mother and baby animals. Very little text, may be read to pupils.

Selsam, Millicent E. *Egg To Chick.* New York: International Publishers, Inc. (Young World Books), 1946.
Interesting, accurate pictures of life cycle of a chicken. Simple text to read to pupils.

——————. *Play With Trees.* New York: William Morrow & Company, 1950.
Excellent black-and-white pictures of seeds, stems, leaves, buds, and flowers on trees. Many simple experiments. Text may be read to the children.

Smalley, Janet. *Do You Know About Fishes?* New York: William Morrow & Company, 1936.
Good drawings and simple, informative text.

Teale, Edwin W. *The Insect World of J. Henri Fabre.* New York: Dodd, Mead and Company, 1949.
An informative book for the teacher who is interested in the early scientific work with insects.

Tresselt, Alvin. *Hi, Mr. Robin!* New York: Lothrop, Lee & Shepard Company, Inc., 1950.
Interesting story of a small boy, tired of winter, who learns the signs of spring. Many colored pictures. Pupils will enjoy having this read to them.

————————. *Johnny Maple Leaf.* New York: Lothrop, Lee & Shepard Company, Inc., 1948.
Large pictures, simple text. Story suitable for illustrating the effects of the changing seasons on a leaf and its surroundings.

————————. *Rain Drop Splash.* New York: Lothrop, Lee & Shepard Company, Inc., 1946.
Large four-color pictures. An imaginative account of how rain from the clouds travels to join the sea.

————————. *Sun Up.* New York: Lothrop, Lee & Shepard Company, Inc., 1949.
Large colored pictures. Simple text telling of the sun and the changeability of weather within a day.

————————. *The Wind and Peter.* New York: Oxford University Press, 1948.
Black-and-white pictures and simple text illustrate the effects of the wind on several kinds of weather.

Weather Bureau. *Cloud Forms.* Washington, D. C. (The teacher may send for this material.)
Good material for teacher reference and class display.

Webb, Addison. *Song of the Seasons.* New York: William Morrow & Company, 1950.
Excellent black-and-white drawings of mammals, birds, insects, and frogs. Text treats their habits and habitats during the four seasons.

Webber, Irma E. *Anywhere in the World.* New York: William R. Scott, 1947.
Plant and animal adaptation. Excellent pictures. Simple text may be read to pupils.

————————. *Travelers All.* New York: William R. Scott, 1944.
Clear, realistic drawings and simple text give information on how plants scatter their seeds.

————————. *Up Above and Down Below.* New York: William R. Scott, 1943.
Stylized drawings of many common plants. Makes very plain the root structure as well as the part that appears above the ground. Simple text.

Weisgard, Leonard. *Whose Little Bird Am I?* New York: Thomas Y. Crowell Company, 1944.
An excellent book to stress the relation of animal structures to food getting.

Williamson, Margaret. *The First Book of Bugs.* New York: Franklin Watts, 1949.
Many excellent drawings. Interesting information for pupils about insects and spiders.

W. P. A. Writers' Program (Ralph De Solo, editor). *The Bird Book.* Chicago: Albert Whitman and Company, 1941.
Many photographs taken in various American zoos. Little text.

————————. *The Reptile Book.* Chicago: Albert Whitman and Company, 1941.
Same as above.

————————. *The Zoo Book.* Chicago: Albert Whitman and Company, 1941.
Same as above.

Zaffo, George J. *The Big Book of Real Fire Engines.* New York: Grosset and Dunlap, 1950.
Large colored drawings of fire-fighting equipment. Text may be read to children.

————————. *The Big Book of Real Trains.* New York: Grosset and Dunlap, 1949.
Large colored drawings of different types of railroad cars. Text may be read to children.

Zim, Herbert S. *Owls.* New York: William Morrow & Company, 1950.
Excellent black-and-white drawings. Accurate information about growth cycles, habitats, and habits of many species of owls. May be read to pupils.

————————. *Rabbits.* New York: William Morrow & Company, 1948.
Many black-and-white drawings. Life cycles, habitats, and habits. Also care and feeding of rabbits. May be read to pupils.

————————. *Snakes.* New York: William Morrow & Company, 1949.
Black-and-white drawings of North American snakes. Life cycles, habitats, and habits. Text may be read to children.

Zim, Herbert S., and Gabrielson, Ira N. *Birds.* (a Golden Nature Guide). New York: Simon and Schuster, 1949.
One hundred and eighteen paintings in color. An excellent reference for the teacher.

Appendix

Materials and Equipment

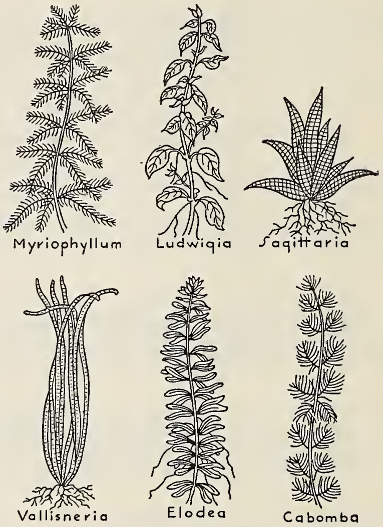
Materials listed in these pages are needed in connection with the activities suggested in the lesson plans for *All Around Us.* Additional materials required in the presentation of a page or in any extending activity are listed separately in the corresponding lesson plan.

The Aquarium: Every child should have the privilege of observing the complete life activities of animals and plants under their normal environmental conditions. Observation in the open, supplemented by the raising of live animals and plants in the schoolroom, will extend the child's knowledge and understanding far beyond the study of books. Such activities help develop a scientific attitude and promote desirable attitudes toward the environment.

Teachers often feel that they do not have time to take care of a group of aquatic animals. This problem is solved by means of a balanced aquarium. The following simple directions have been planned so that suitable activities may be carried on with a minimum of expense.

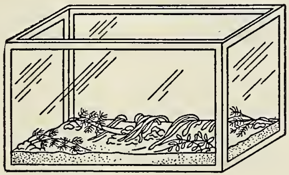
MATERIALS: A square or oblong tank aquarium is the best type to use. Lacking that, the ingenious teacher will find many good substitutes, such as large-mouthed battery jars and fruit jars. Globes are not so desirable as other types, for they distort the appearance of animals and break easily. Thoroughly clean sand, natural objects that are found in streams (such as attractively colored pebbles that have been shaped by water action), and the proper kinds of plants and animals are essential for stocking an aquarium. A small net and rubber tubing for a siphon are necessary for dipping the animals and changing the water.

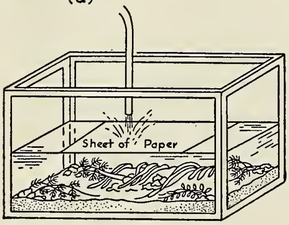
PLANTS: The close observer in the field will need no special instruction as to the types of plants desirable for the aquarium. Eelgrass, water milfoil, pondweed, water cress, and certain kinds of algae can be collected from the habitat where they are growing and placed in the tank to grow under similar conditions. A florist or pet shop can furnish such cultivated varieties as those illustrated.



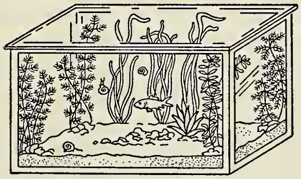
ANIMALS: A good caution is not to overstock the tank. For fish, the rule is "one inch of fish to one gallon of water." This does not include insects, tadpoles, etc. The number of these animals depends on the size of the aquarium. An average proportion is one gallon of water for one one-inch fish, one tadpole, one snail, and several water insects. Goldfish should not be used in a school aquarium unless native types cannot be obtained. Some native fish that thrive in an aquarium are catfish, mud minnows, sticklebacks, and perch. Snails of the common fresh-water type are desirable as scavengers. Clams and fresh-water mussels should be used if possible. One is usually sufficient for an average tank. Very small turtles (one inch in diameter across the back) may be added. They must be well fed to keep them from attacking other animals. Rocks that will project out of the water must be provided, so that the turtles can get above the water to breathe. Bullfrog tadpoles and newts or salamanders may be taken from springs and streams. Desirable insects are dragonfly nymphs, back swimmers, water boatmen, water striders, and whirligig beetles. Care must be exercised with predacious insects, as they often attack other animals.

SETTING UP THE AQUARIUM: Clean the container thoroughly. Put in a one- to two-inch layer of clean sand. Place the aquarium where it is to stay permanently. The most desirable place is one where it will not receive much direct sunlight but plenty of diffused light, such as near a north window.


(a)



(b)


(c)

In arranging the plants and natural objects try to make them resemble a natural pond. Anchor each plant in the sand at the bottom of the aquarium by embedding about an inch of the base of the stem and placing pebbles around the base. The upper part of the plant can then be allowed to lie flat on the sand, as it will straighten to an upright position when the water is put into the aquarium (Figure a).

Place a large piece of paper over the plants and the sand and gently siphon the water in on top of it (Figure b). The paper will prevent displacing the sand as the water is poured in and should be removed when the aquarium is filled. Use water from a spring or clear stream, as tap water often contains chemicals that are harmful to animal life. Let the aquarium stand for several days until the plants adjust themselves. Then put in the animals. (See feeding directions under Care of Animals, page 63.)

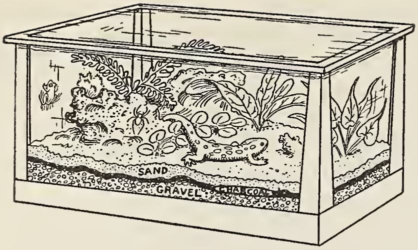
Caution: Watch the aquarium closely. The water may have to be changed often at first. Animals use the oxygen of the water for breathing, while plants use the carbon dioxide which is a waste product of animal life. Plants manufacture oxygen. In this way the balance of aquarium life is maintained. Do not overfeed animals. Remove dead animals and plants immediately.

The Terrarium: A moisture-tight container is best suited to terrarium construction. Like the aquarium, it should be either square or rectangular because of the better view afforded. If the straight-sided type cannot be had, any glass jar or container may be used. The larger ones are more desirable. Use a piece of plain window glass for a cover.

Almost any plant that grows in the local environment may be raised successfully by simply noting its growing conditions and reproducing them as nearly as possible in the terrarium. Delicate plants may be made to live for long periods in a properly regulated terrarium. The secret of success lies in controlling the moisture by means of a tight glass cover. Plants which require little or no moisture may be kept in containers with screen or glass covers.

The terrarium should be placed where it will receive plenty of light and, if possible, a little early morning sunlight. Care must be taken that it does not receive enough direct sunlight to make the plants "scald" because of too high temperatures. A northeast window is ideal for the average terrarium. Place the container in the location where it is to stay and leave it, as continual moving of the container is bad for both plants and animals.

Ordinary room temperatures are suitable for plants and animals usually found in the vicinity. If the temperature of the schoolroom falls very low over weekends, very little success can be expected. An average nightly temperature of 50° and a daytime temperature of 75° will give good results.



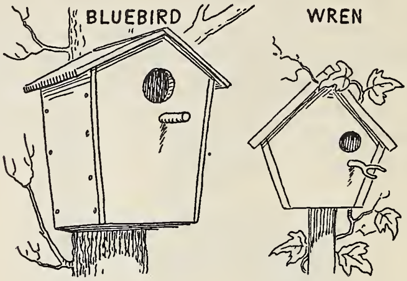
One of several kinds of habitats may be reproduced in the terrarium, but only a few of the most common types will be discussed here. First establish those that match the environment near the school and those with which the pupils are most familiar. As interest grows, others may be established to show different conditions.

The Woodland Type: In the bottom of the container place a layer of sand or coarse gravel about an inch and a half thick. On top of this spread a layer of loose, rich humus from the forest floor. On field trips to deep woods select small plants for the woodland terrarium. A small salamander (land type) and two small toads may be placed in it. Feed the animals as directed on page 63. Keep the terrarium covered with glass and exclude the most direct rays of sunlight.

The Marsh Type: Place a layer of gravel on a slope, so that it will be about four inches high at one end and about an inch high at the other. Cover this layer with rich, moist earth from a bog. Put in plants that require much moisture —mosses (sphagnum is good), small clumps of marsh grass, and similar plants. Place the plants (see Setting up the Aquarium, page 58) and put water in the lower end to a depth of two inches. Animals such as small turtles, a small fish or two, small frogs, etc., will complete the animal life. Feed them as directed on page 63 and keep the terrarium covered.

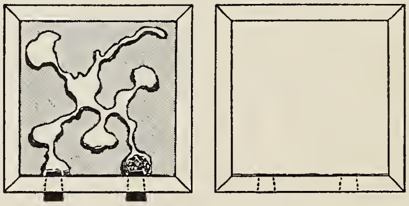
The Desert Type: Construct this kind of terrarium when a study of conditions prevailing in very dry countries is desirable. Use coarse gravel covered with sand as a base. Place small cactus plants of various types in natural positions. Cover the roots completely. Water the plants very sparingly once every two or three weeks, as they tend to decay if watered too often. Keep a small pan of water in one corner for the animals to drink from. Animals such as horned toads and fence lizards may be kept successfully. Feed as directed on page 63. Cover the terrarium with screen wire.

Feeding Stations, Bird Bath, Birdhouses: Birdhouses will vary to fit the needs of different kinds of birds.



A satisfactory feeding table can be made from a wooden packing box. Provide a slanting roof and leave at least two sides closed for protection. Mount it on a post where it can be easily observed from the schoolroom. Birdhouses, feeding stations, and the bird bath should resemble natural conditions as nearly as possible, should be safe from cats, and should be put where they can be seen by the pupils.

The Ant Nest: An ant colony makes an interesting study for children. A house or nest can be constructed as illustrated below. Use two pieces of glass, held one eighth to one quarter of an inch apart by strips of wood glued around the edges. Place one piece of glass flat on a table and glue one-quarter-inch strips of wood around three edges, using water glass or glass cement. On the fourth side leave two openings (Figure a). After the glue is dry, fill the frame with a mixture of sifted loam and sand, leaving a space in the center for the ant colony and spaces near the two openings in the one side of the frame which are to be plugged later to keep the ants in (Figure b).


(a) (b)

Ant colonies may be found beneath logs or stones, or in underground nests in gardens and lawns. When a colony has been found, look carefully for a queen or two. The queen can be identified by her large size. With a trowel, scrape up a queen and as many of the other ants, eggs, and larvae as possible and take them home in a glass jar with a tightly screwed lid. Place the ants in the center space left in the ant house. Then glue on the top piece of glass. In one of the holes in the frame place a small sponge, which must be kept wet, as ants cannot live without moisture. The other hole is for food. Bind all the edges with adhesive tape. Then plug the two holes with removable stoppers. Feed the ants from time to time, dropping bits of meat, bread, grains, sugar, drops of honey, and dried insects into the food hole. Keep the frame covered to exclude light for a day or two. By then, the colony will be established and can be observed.

The Insect Collection: For the insect collection the local druggist may be able to make the cyanide, or killing, jars. These jars may also be obtained from any biological supply house. *Under no circumstances should the children attempt to make them.* Specimens should be carefully checked to determine whether they are insects, and acceptable specimens can be kept in regular specimen cases, in shallow cotton-lined boxes tightly covered with glass or cellophane, or in cigar boxes lined on the bottom with corrugated pasteboard. Pamphlets on the collecting and mounting of insects may be obtained from any state university or museum of natural history.

Charts and Posters: Throughout the *Guidebook* it is suggested that charts and posters be used. Pictures cut from magazines supplement those in *All Around Us* and give the pupils additional examples to compare, to classify, and to serve as a base for their generalizations. The teacher should letter the captions; the pupils cut out and mount the illustrations. Suggested captions are *Birds We Know, Animals That Are Hatched, How Animals Grow, Babies That Find Their Own Food, Machines Do Work, Animals Work, We Work, This Is Easy, This Is Hard, Things We Do When the Weather Is Hot, Wind Is a Helper, Animals in Winter, How Flowers Grow, Seeds That Float, Leaves We Know,* etc.

The Garden: Children should be interested in plants as living things needing food in order to thrive and grow. Such interest is fostered through personal experiences in caring for plants. There is no better project for the application of knowledge concerning desirable growing conditions for plants than an outdoor garden.

Indoor Plants: In addition to their value as experiential material for children, plants have decorative values and can make the schoolroom a more pleasant place in which to work.

POTTED PLANTS: For windows with good light—flowering begonia, coleus, desert plants, flowering bulbs, impatiens (commonly called "everbloomers"), geranium.

For windows with north light—asparagus or Boston ferns, grape ivy, Boston ivy, begonia (foliage varieties), philodendron.

THE WINDOW BOX: Plants in different stages of growth—seeds just sprouting, very young plants, flowering plants, and those producing seed—may be grown in window boxes.

Make a box that is long enough to fill the window space it is to occupy. Use planks that are one foot wide for the sides and bottom and a one-foot square for each end.

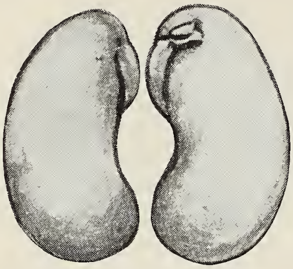
Several holes should be bored in the bottom to provide drainage. Pieces of screen wire should be placed over the holes to prevent the soil from sifting through. Place a layer of coarse gravel at least an inch thick in the bottom of the box and then add rich, loose humus to within an inch of the top of the box.

The soil should be finely pulverized and in a moist condition before the seeds are planted. When the seeds have been planted, moist newspapers should be kept over them until they have germinated. Such plants as petunias, French marigolds, and sweet alyssum may successfully be raised to the flowering stage in the schoolroom. Tomatoes, calendulas, and zinnias can be transplanted to the garden.

Carry the activity to the flowering and fruiting stages of plants, to present a complete idea of the life cycle of plants. Lettuce, radishes, zinnias, marigolds, etc., grow and seed quickly.

Seeds: The pupils will be interested in the manner in which the seeds for their garden sprout and grow. While there should be no discussion of food-making in plants at this stage, it is not only permissible but advisable to show

how seeds are equipped for growth. Use large seeds such as dried Limas, navy beans, or nasturtium seeds. Soak overnight and then carefully remove the outer coating. Split the seed and allow the children to inspect it. They can see the large fleshy parts of the Lima bean. These are the seed leaves and contain stored food for the tiny plant which the children can also see.



In order that the pupils may understand that the roots grow downward, plant corn, Lima beans, or other large seeds in a glass jar. Line the jar with moist blotting paper. Put corn or other seeds between sides of jar and blotting paper. Fill interior of jar with sand or sawdust. Plant seeds so that they may be seen in a variety of positions. Plant them about one inch apart. Place the jar in a warm place and keep moist but not too wet. Time for sprouting, 4-6 days.

It is advisable to work with large seeds at this level because they are easily seen and handled by children. However, very small seeds, such as mustard, snapdragon, petunia, etc., should be used now and then in addition to the large seeds. This will avoid any erroneous ideas about the relation of size of seed to germination and growth. Tiny seeds germinate readily on damp cotton or moist blotting paper. Allow 4-6 days.

Elements of Plant Growth: To demonstrate to the pupils that there are certain requirements for successful plant growth, stress the need for light and water by giving one plant water, one no water, one plant light, and one no light. Use seedlings for this work (pots of Lima bean seedlings are very good) rather than older plants with well-established root systems and allow 1-2 weeks for the experiment.

To demonstrate the difference in time intervals from planting to the appearance of the first two leaves and to the appearance of true leaves, plant seeds (petunia, snapdragon, Lima bean, aster, and thunbergia will give a good variety.) in a half-and-half mixture of garden loam and sand. To provide drainage put a layer of gravel or pieces of broken flower pots in the bottom of the flat or pot. Water the seeds sparingly and cover or keep in a dark warm place to hasten germination.

Trees and Shrubs: It is helpful to have branches of trees or shrubs available for study just when they happen to be dormant. If this occurs, branches can be forced. Use a sharp knife when cutting them from the parent plant and make a diagonal cut so as to give the largest possible open surface for water-absorption. Place the branches in water. The length of time required for forcing depends upon several factors, but these intervals are broadly correct: apple, pussy willow, weeping willow, 6-10 days; lilac, 8 days; forsythia, 10-14 days.

While it is possible to force branches, the pupils will be somewhat hampered in observing likenesses and differences in trees where leaf identification is involved.

Plant Collections: Most children love to collect, and should throughout the year be encouraged to collect leaves, seeds, seed pods, etc.

Leaves and many flowers may be pressed between heavy books or other weights and then mounted with scotch tape on posters or in notebooks.

To make an interesting and decorative leaf plaque, fill (to half way) a small pie tin with moist clay. Firmly press a leaf on the clay so that the veins and outline can be seen clearly. Remove the leaf and brush the surface of the clay with soapsuds. Pour plaster of paris which has been mixed with water into the tin. A hanger can be made by inserting a looped string or small wire. When the plaster has hardened, remove the pie tin and the moist clay. Now wash the plaster of paris gently and let dry. The leaf impression may be painted—tempera (poster) paints give the most satisfactory results.

To make leaf outlines, place a leaf on a piece of paper. About six or eight inches above the paper, hold a piece of wire screening. Then dip a toothbrush in ink and brush lightly across the screen. A delicate leaf outline results.

Care of Plants

Temperature: A daytime temperature of 65°-70° and a night temperature of 55°-60° is desirable in the schoolroom for normal plant growth. When the outside temperature is excessively low, protect the plants from freezing by placing newspapers between them and the windowpanes.

Water: Water the plants only when they need it—when the soil is dry. Enough water should be given at one time to wet the soil to the bottom of the pots. Then wait until the soil is dry before watering again. Sprinkle the leaves thoroughly once a week in order to keep them free of dust and soot.

Soil: (See suggestions under The Window Box, page 61 of this *Guidebook.*)

Pests: Plants are frequently attacked on the underside of the leaves by small green lice, mealy bugs, and scales, which are lice with a hardened outer covering. To rid the plants of lice and mealy bugs, wipe the under parts of the leaves with soapy water made with a mild soap. Scales can be removed only by using a toothpick or a dull, pointed knife to lift them. Then wash the affected parts with the soap solution.

Care of Animals

The children should be taught to care for the animals in the pet room at school, and they should be made to feel responsible for their comfort and welfare. The following points should be stressed:

Quarters: Provide roomy and comfortable quarters for each animal. The aquarium and terrarium take care of this problem in the case of the animals that are fitted to live in them. Cages of screen, hardware cloth, or other material should be provided for mammals and birds. The cages must be cleaned daily, or the pets will become diseased. Cages should have removable bottoms for cleaning facilities and stationary containers for food and water. Line them with newspapers or other material that may be destroyed. Provide straw or comfortable boxes for mammals to sleep on. Mammals should not be kept indoors for more than a day or two at a time.

Water: Provide the animals with fresh water daily.

Feeding: Feed them daily. Remove the surplus food after the animals have eaten. Provide plenty of food; the animals will not overfeed. There is no more pitiful spectacle than half-starved animals in a laboratory.

Delicate animals, such as guinea pigs, should be fed twice daily and at regular times. Early morning and late evening are best. On Saturdays provide enough to last over Sunday. Cold-blooded animals, such as frogs, lizards, swifts, turtles, etc., do not require as much food as warm-blooded animals. Once a day is ample. A large feeding every other day is sufficient in most cases. Do not leave uneaten food to foul the water in the aquarium.

Vary the diet to prevent weakness and disease. The following food list is suggested:

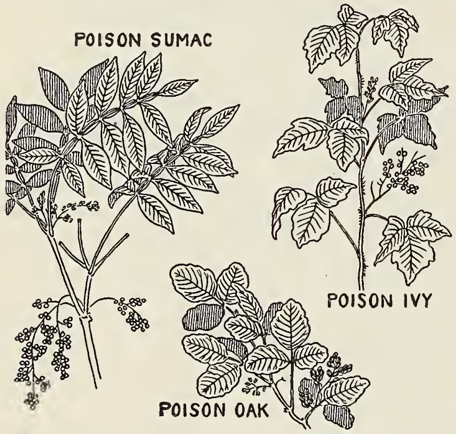
Snails: Lettuce leaves, aquatic plants, powdered meat, powdered cuttlefish bone
Fishes: Prepared fish food, chopped beef, particles of earthworms
Salamanders and lizards: Flies, earthworms, chopped beef, liver
Frogs: The diet varies with the kind of frog. Insects, fruit flies, roaches, earthworms, larvae, chopped beef, very small strips of liver, etc.
Turtles: Overripe fruit, lettuce, clover, carrots, strips of liver.
Snakes: Small frogs, mice, lizards, beef, liver, chicken scraps
Rats and mice: Table scraps, cheese, wheat-flour paste mixed with milk, pinch of salt and lime, dried yeast, lean meat, lettuce
Guinea pigs and rabbits: Plenty of succulent green vegetables (at least body weight daily), carrots, turnips, apples, and apple parings, apple cores, pear peelings, tomatoes (rabbits need twigs with bark for gnawing occasionally), water cress, wheat and oat shoots, clover, different grasses, dry grain, and sweet hay.

Field Trips

Providing actual experience in the open with native materials is one of the best ways of applying scientific principles. Careful plans should be made by the teacher before attempting any field work. Some of the factors to be considered in planning the trip are preliminary knowledge of the locality where the trip is to be made; noting and listing features for special emphasis and study; noting available specimens which may be taken; securing permission to visit gardens, fields, markets, and other places of interest; and preparing the children by discussion, picture study, and reading.

During the trip skillful direction should be given by the teacher to help the pupils see and interpret those features contributing to the desired concepts. "What is making that noise near the pond?" (Frog)

Before starting on the field trips, the teacher should warn the pupils about any poisonous plants that may be in the locality. She should show or draw pictures of poison ivy, poison oak, and poison sumac, warning the children not to touch any plant like them.



To afford protection in case such plants are prevalent and because they might accidentally come in contact with the skin, an application of laundry-soap lather on hands and face is recommended before the trip. A thorough scrubbing of the face and hands with laundry soap after the trip is also advisable.

Field trips to the following localities are suggested:

Woods, Park, Garden: To observe seasonal aspects; to observe birds and bird nests; to observe toads, ants, squirrels, rabbits, ground hogs, etc., and their homes; to track animals in the snow; to collect leaves; to observe wild flowers and different kinds of growing conditions for plants; to observe shade and sun, rich and poor soil, etc.; to observe land and water forms.

Farm: To observe farm animals and cultivated crops.

Zoo, Museum: To study specimens of wild animals and plants.

Lake, Pond, Pool: To observe and collect water animals and plants.

Greenhouse, Market, Store: To observe vegetables, decorative plants, and fruits.

Garden, Orchard: To observe leaves, blossoms, and fruits.

Miscellaneous: To observe machines at work.

Questions to Stimulate Picture Discussion

Relating to Things:

1. What is it called?
2. What is it made of?
3. How was it made?
4. What does it look like?
5. Where is it found?
6. How is it like other things?
7. How is it different from other things?
8. How can you recognize or identify it?
9. What can you do with it?
10. How did it get its name?
11. What kind of thing is it?
12. What is its purpose?
13. How does it work or operate?
14. Have you ever seen anything like it? Where? When?
15. What other names does it have?

Relating to Events:

1. What is happening?
2. What has happened?
3. What do you think will happen now?
4. How did this happen?
5. Why did this happen?
6. What caused this to happen?
7. What took place before this happened?
8. Where have you seen something like this happen?
9. When have you seen something like this happen?
10. How could we make this happen?
11. How does this compare with what we saw or did?
12. How can we do this more easily?
13. How can you do this more quickly?

All Around Us

[illegible]

[illegible]

[illegible]

BOOK 1

[illegible]

Scott, Foresman and Company

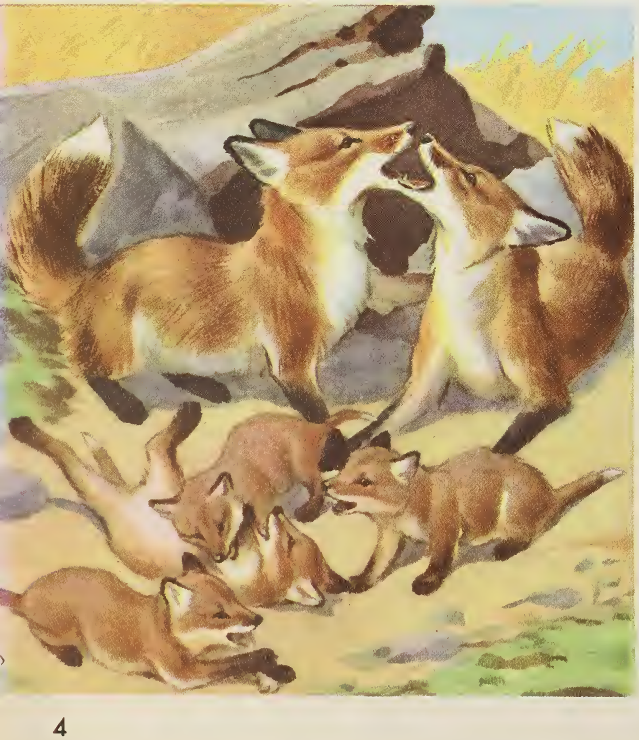
[illegible]

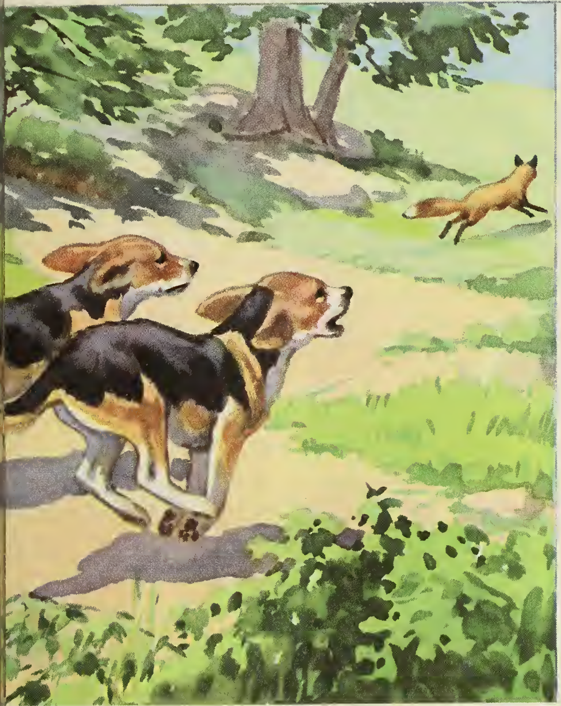
The illustrations for this book were made by the following artists: A. F. Hurford and Miriam Story Hurford (cover, pages 1, 46, 47, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60); Gregory Orloff (pages 41, 44, 45, 48, 49, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75); Dewey Proebsting (pages 29, 30, 31, 34, 35, 36, 37, 38, 39, 40, 42, 43); Walter A. Weber (pages 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28); and Milo Winter (pages 16, 17, 32, 33, 76, 77).

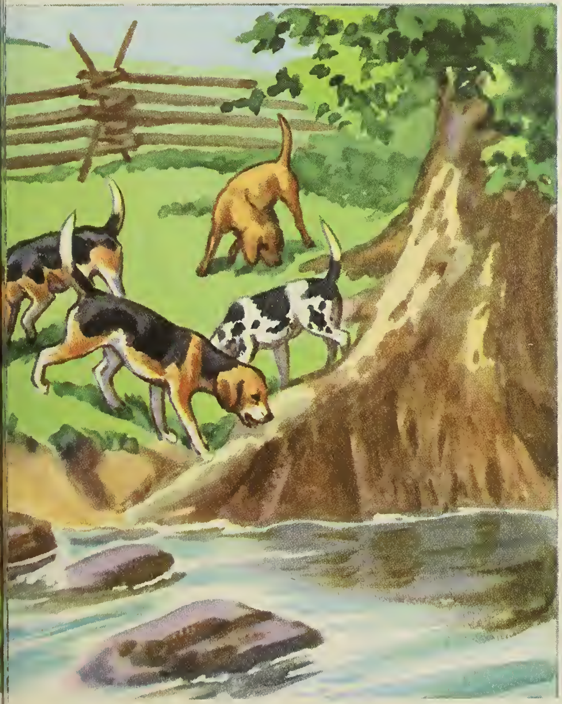
Copyright, 1951, by Scott, Foresman and Company. Printed in the United States of America. Copyright, 1951, in the Philippine Islands by Scott, Foresman and Company.

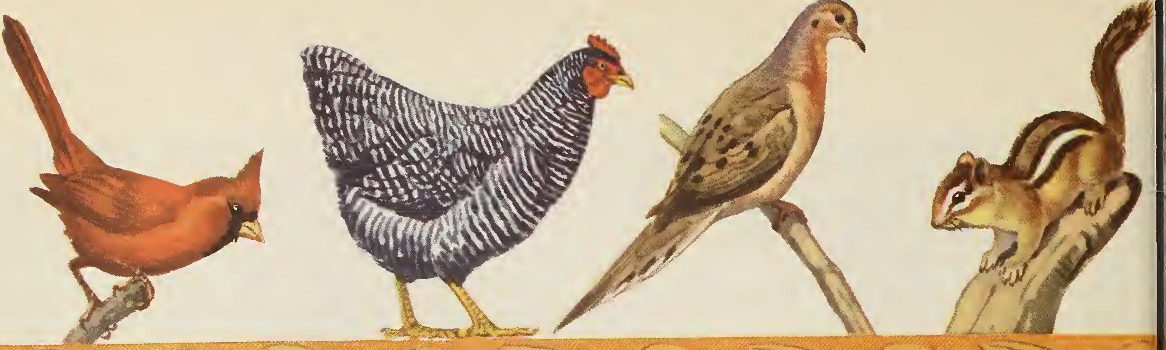
Animals

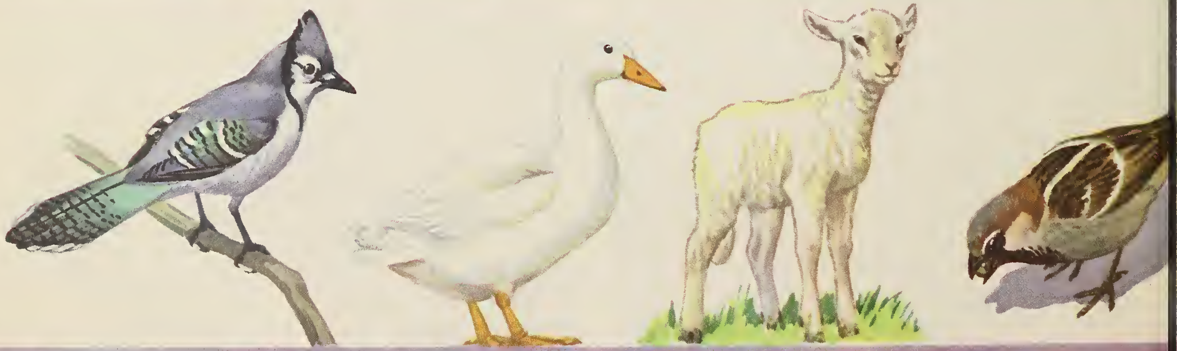
The Fox Family

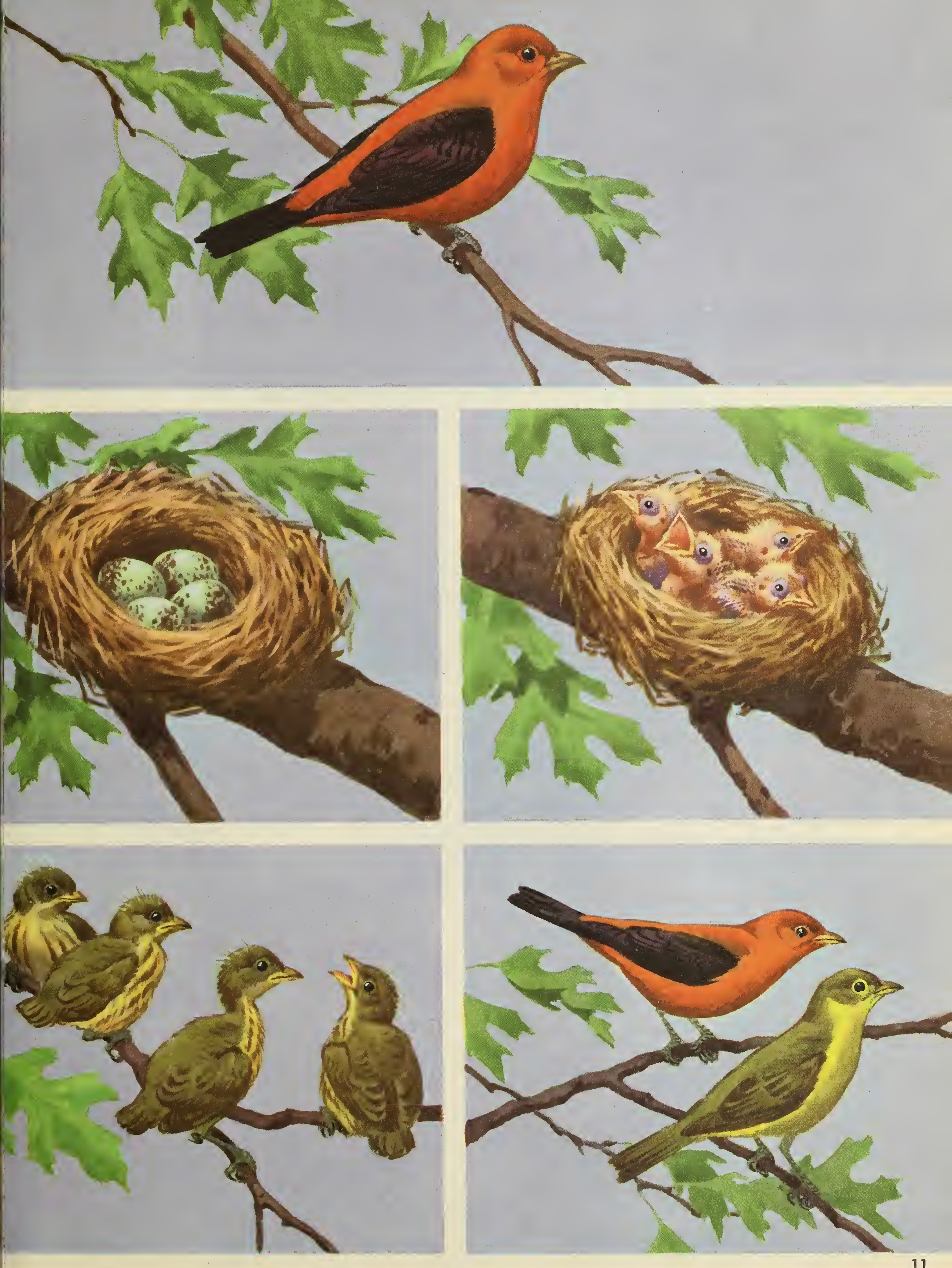


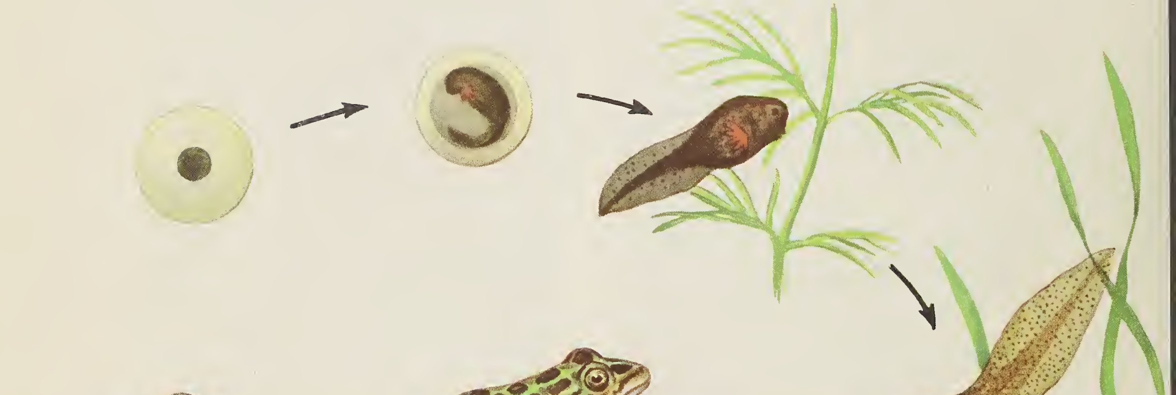


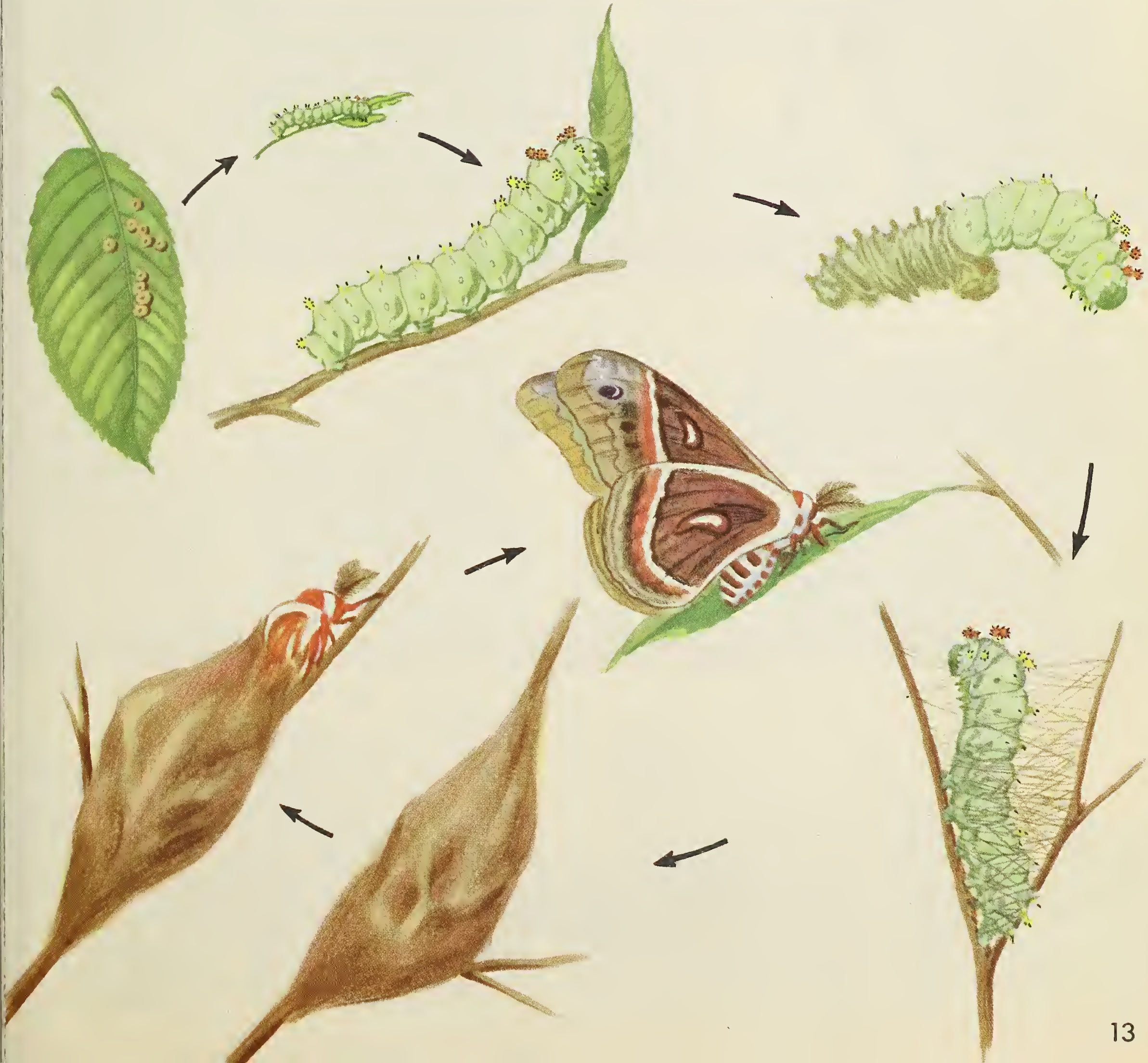


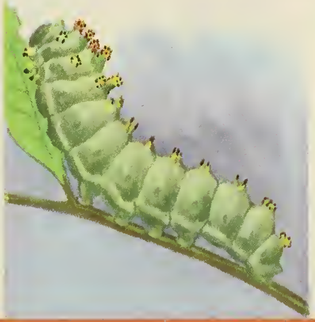




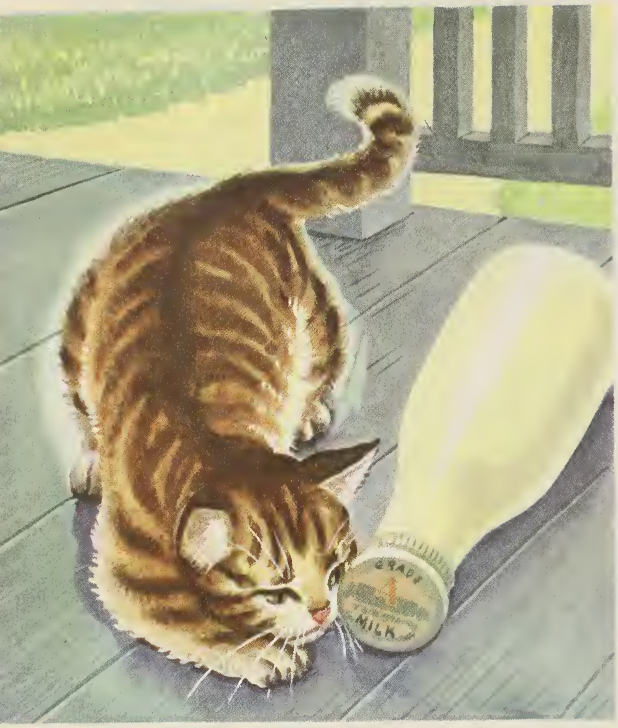


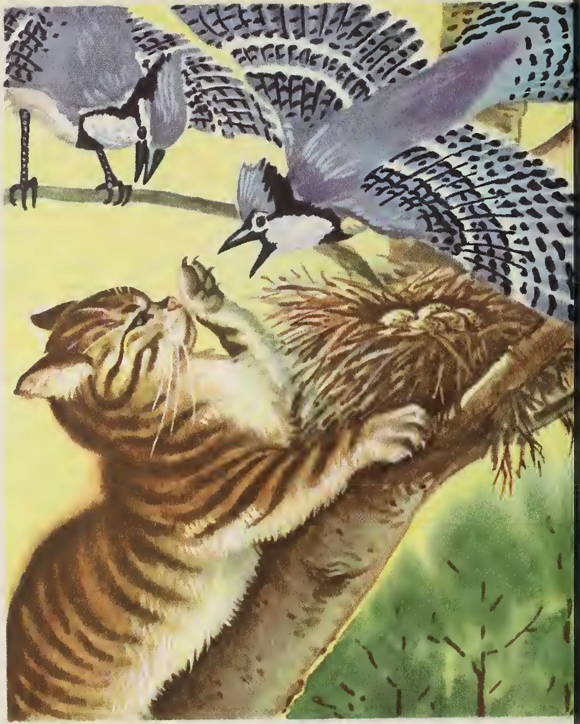


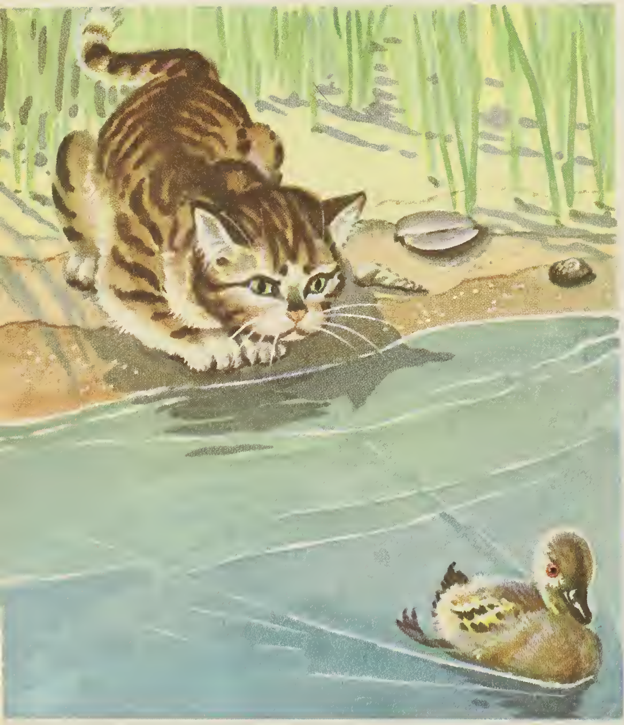


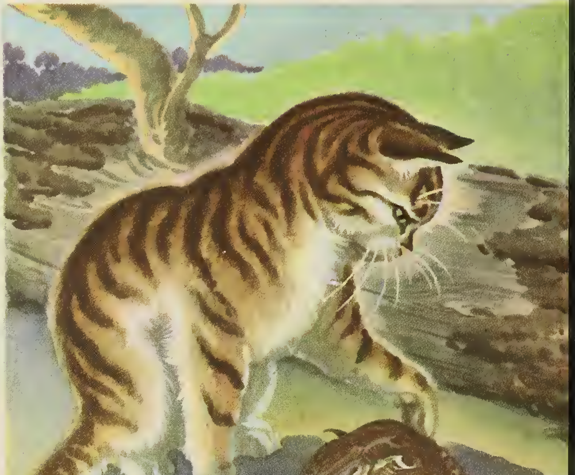


A Hungry Cat

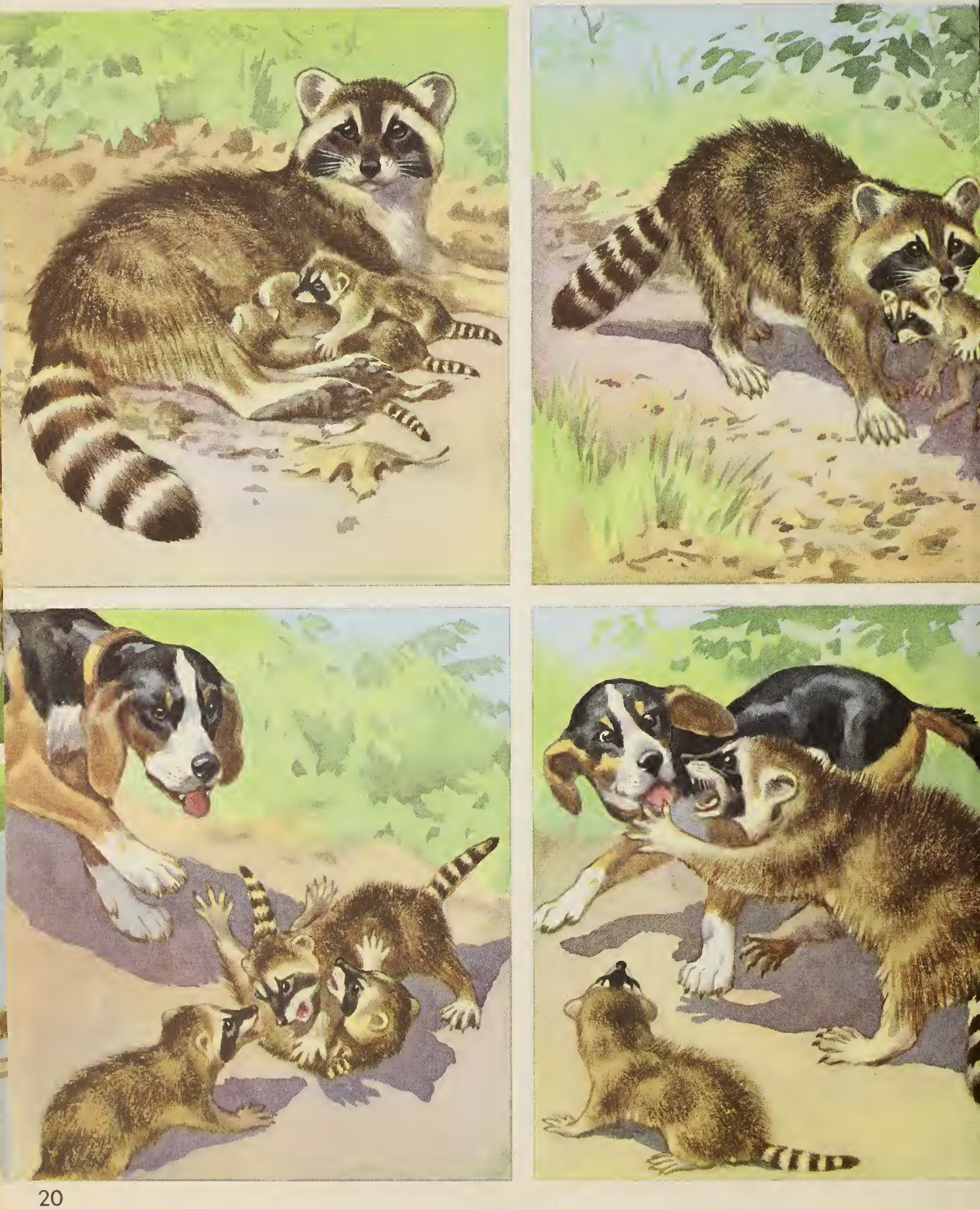




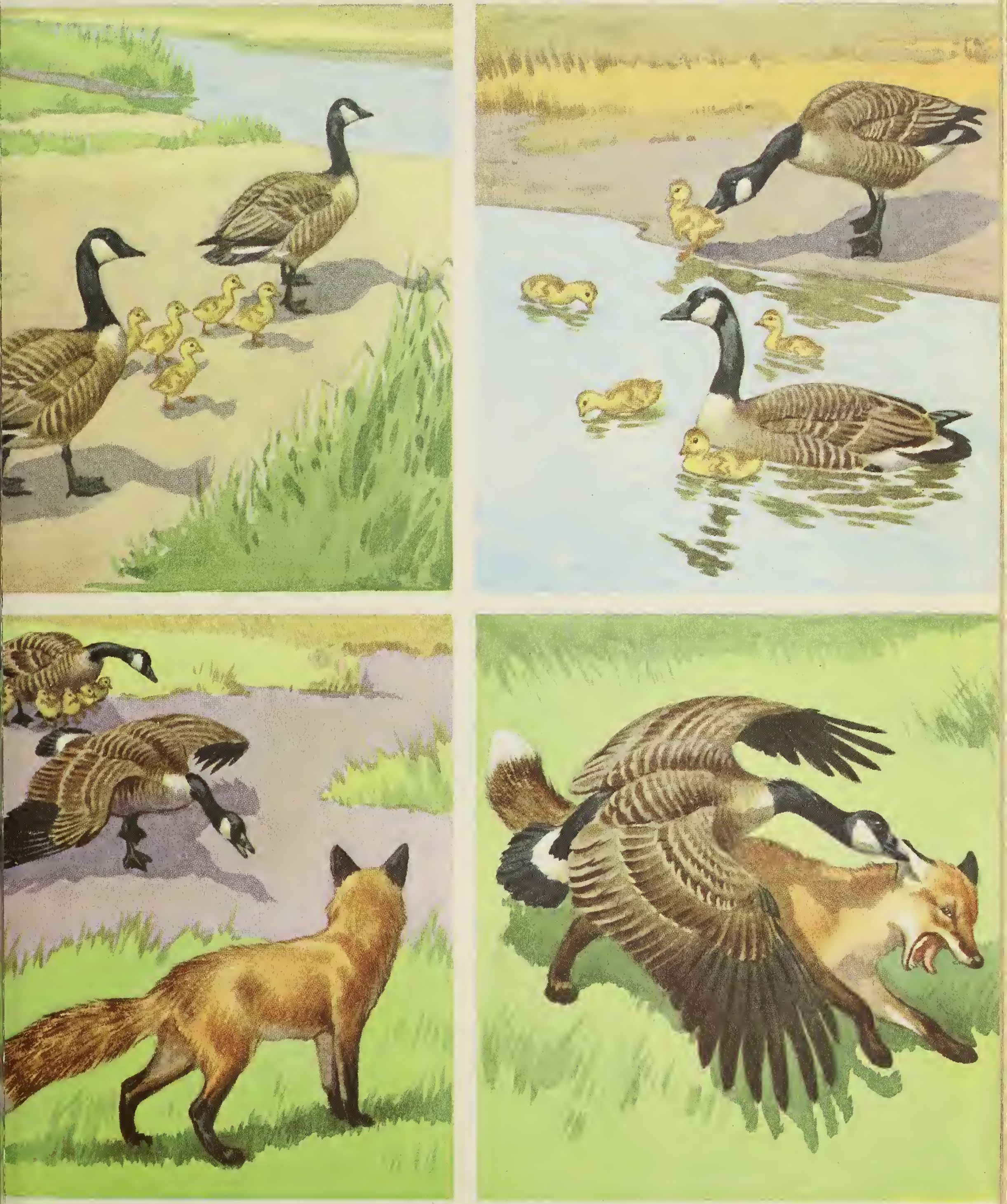


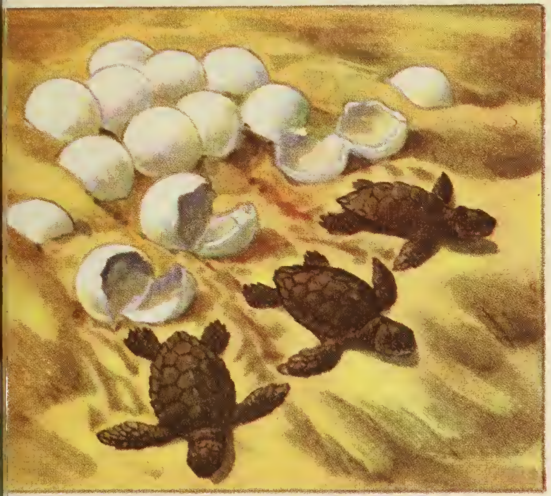


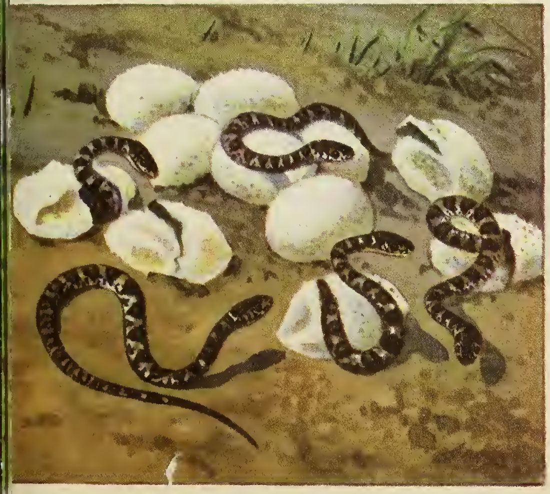
A Raccoon Protects Her Babies

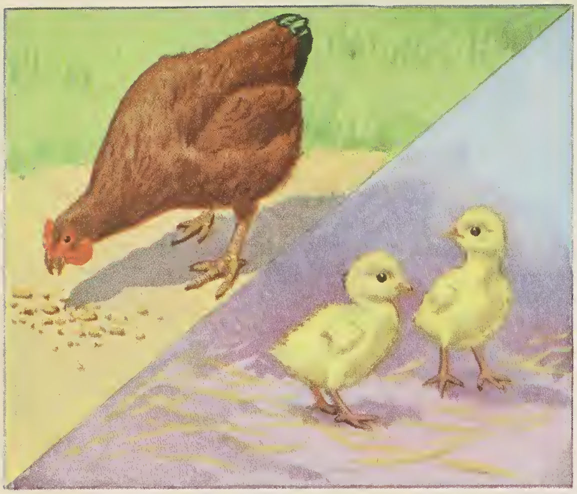
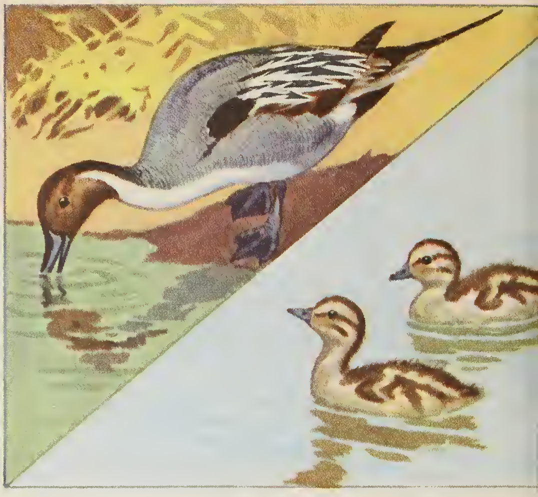


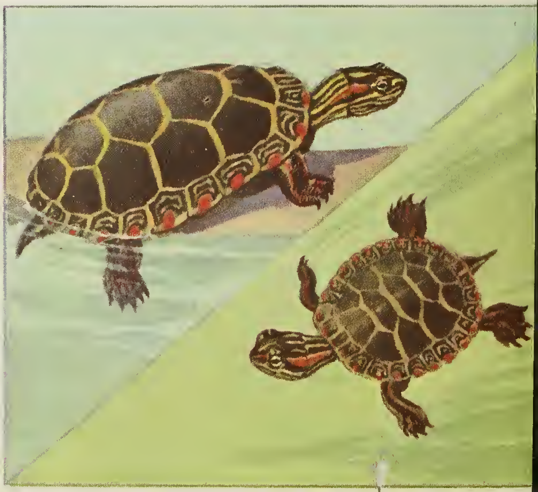
Geese Protect Their Babies

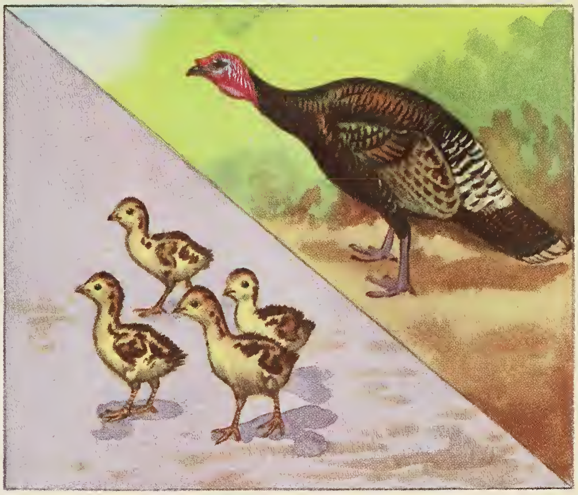
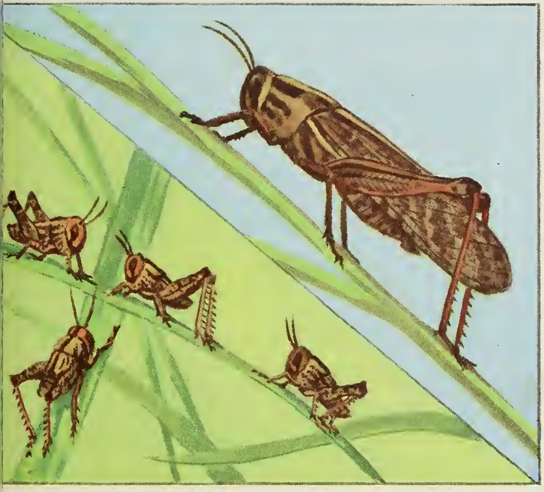


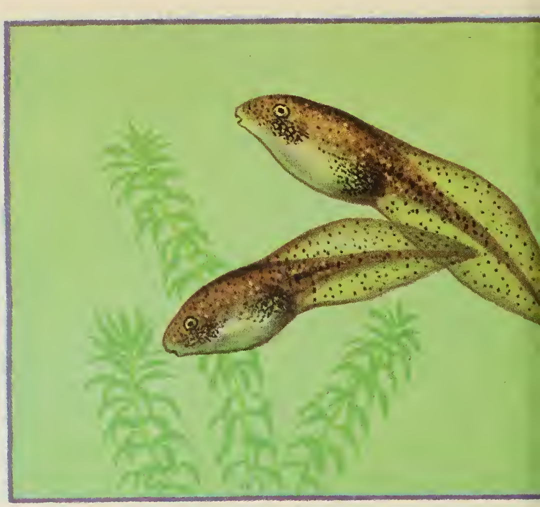






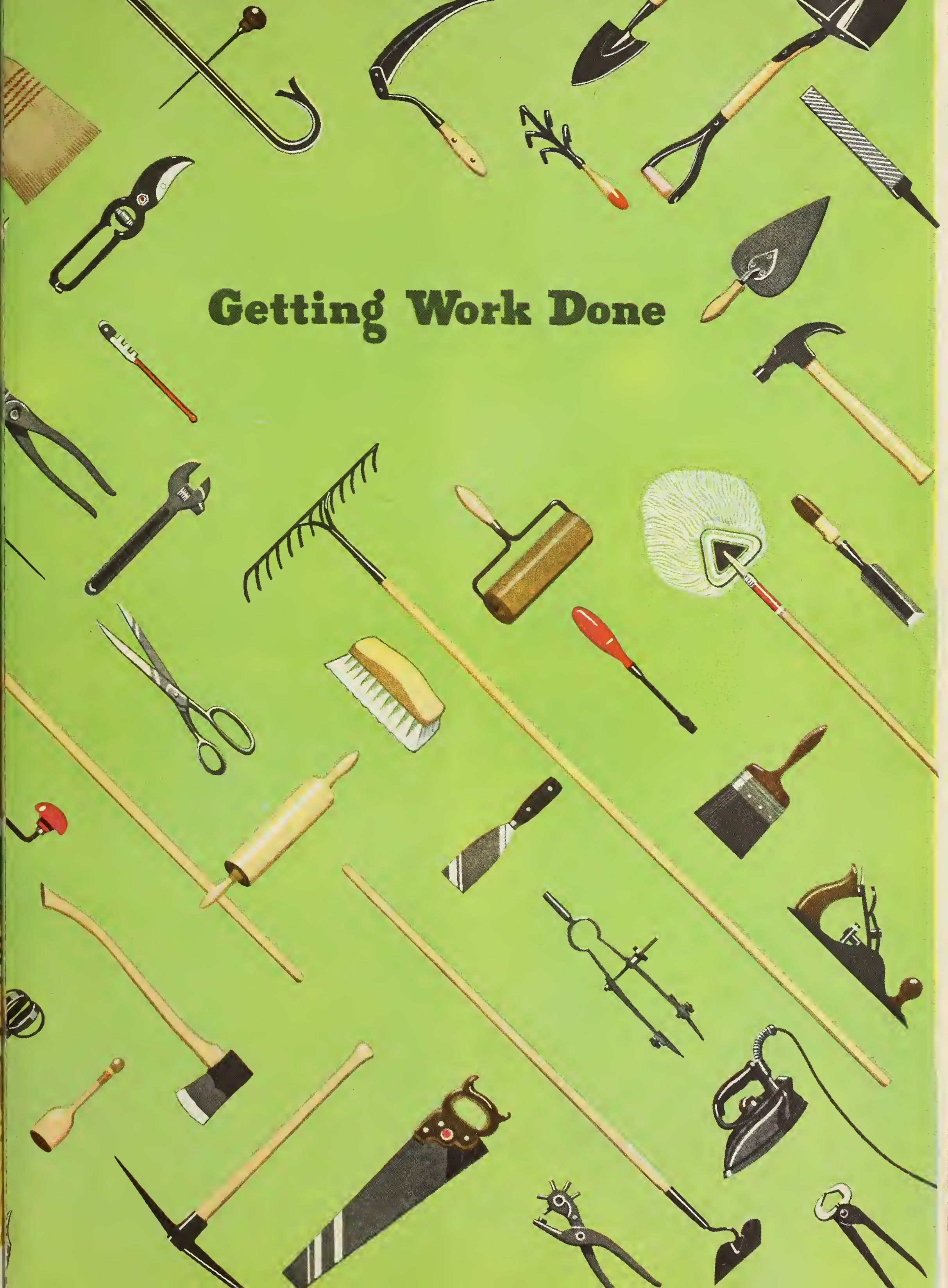





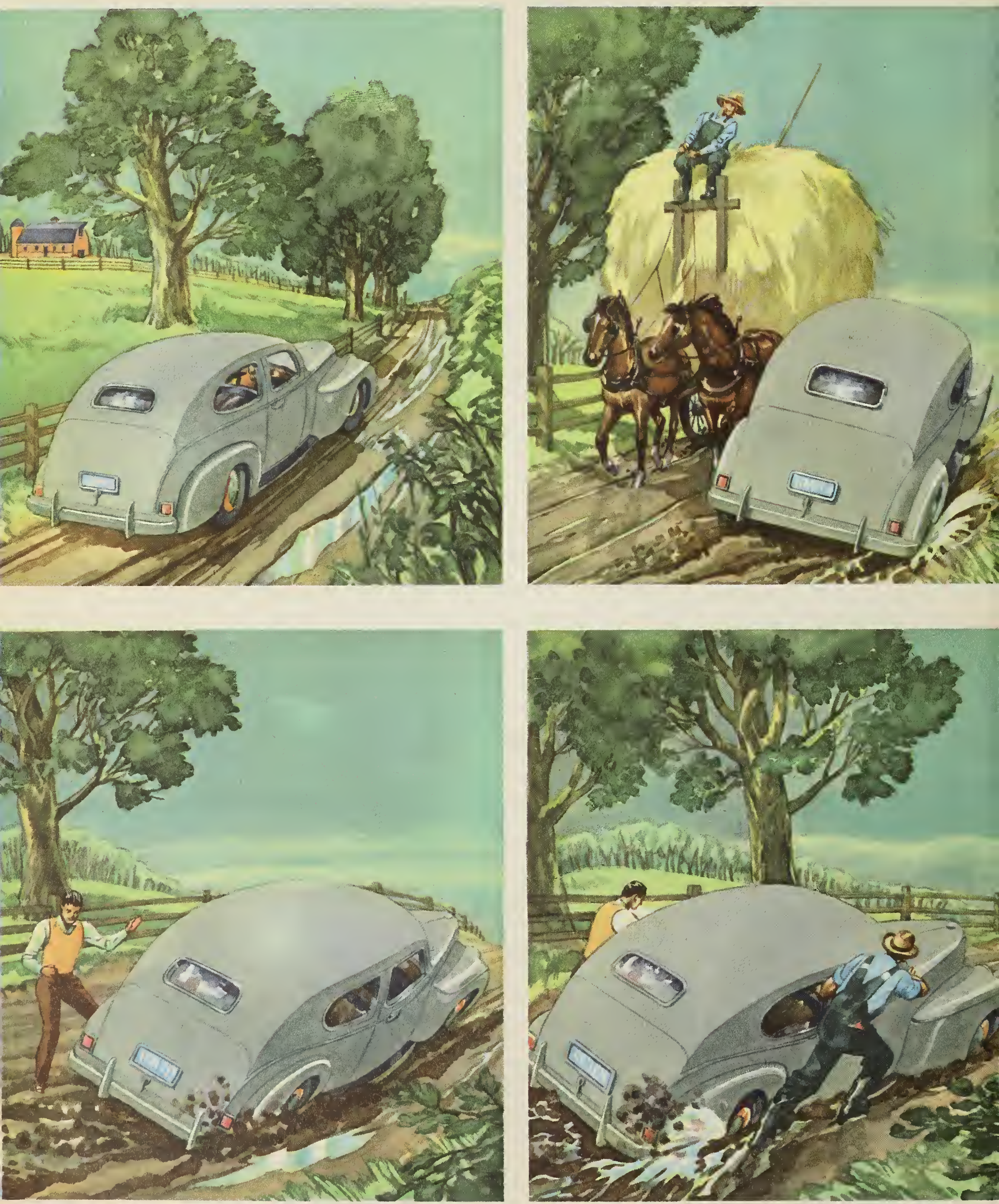
1

6

Getting Work Done



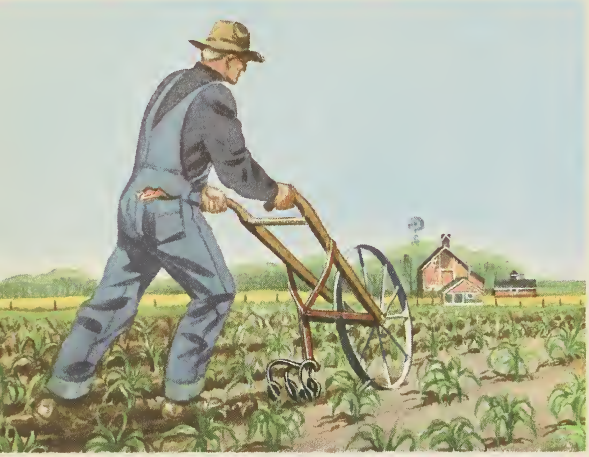
Stuck in the Mud

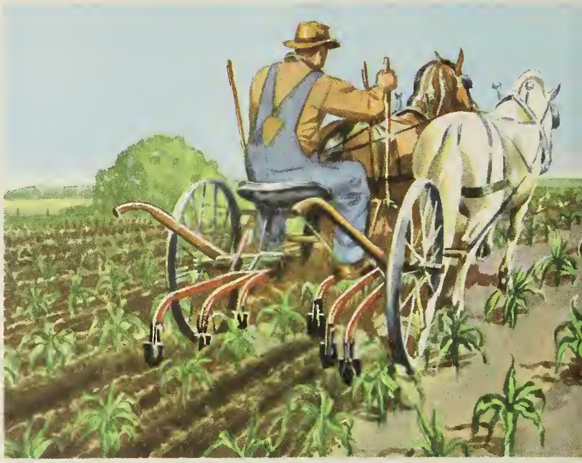


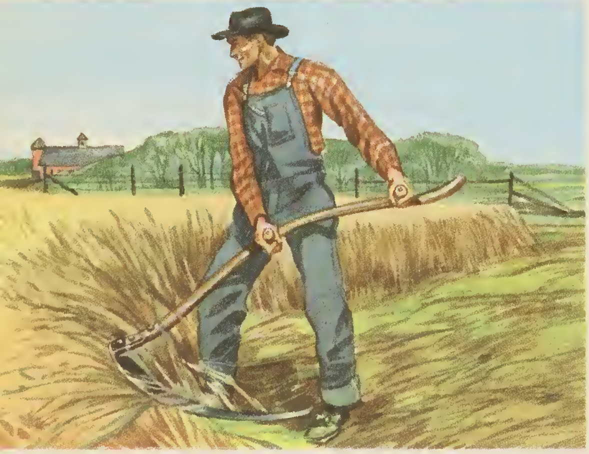
Muscles

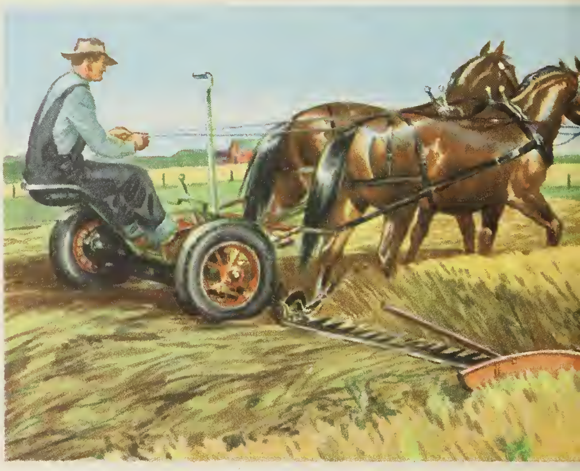
Machines and Muscles

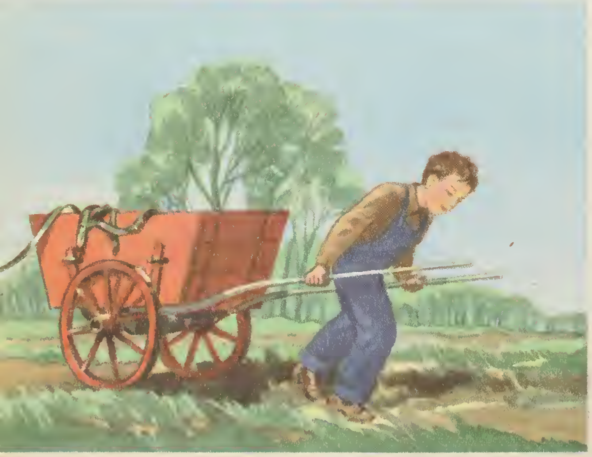
Machines and Animal Muscles

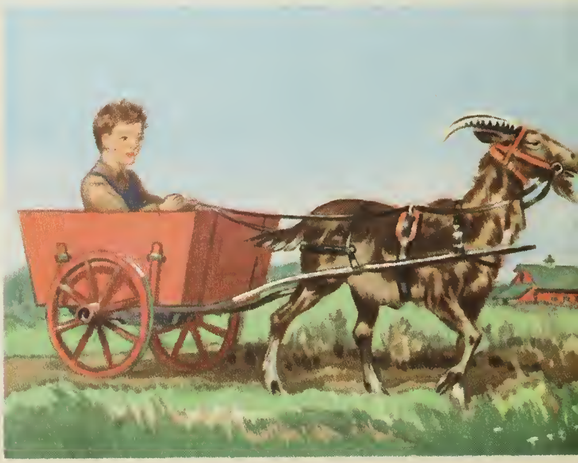




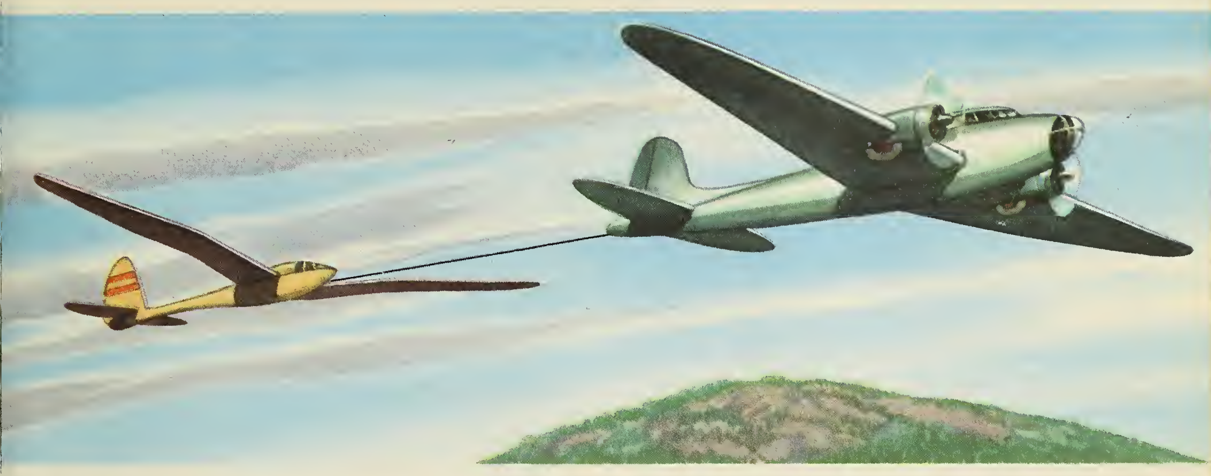


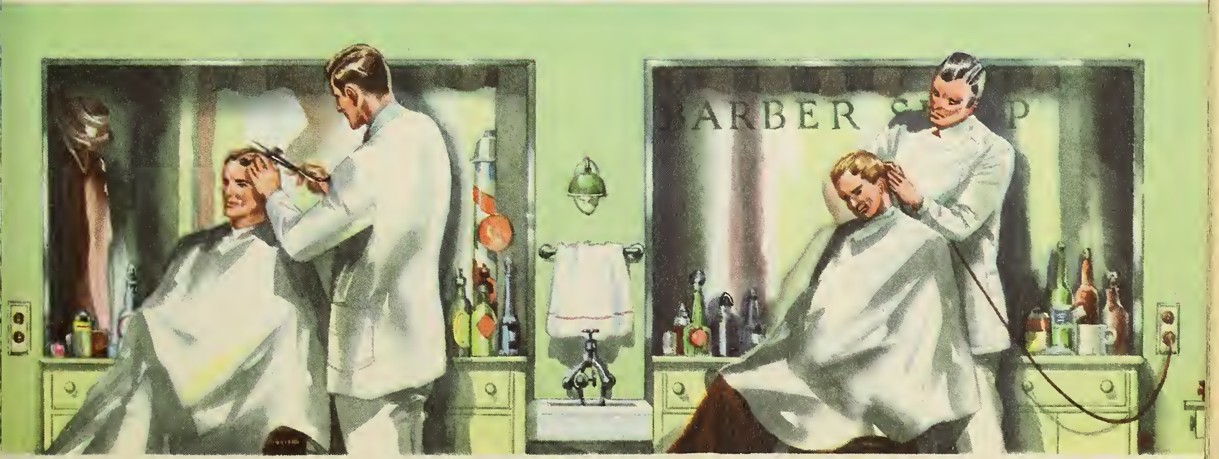


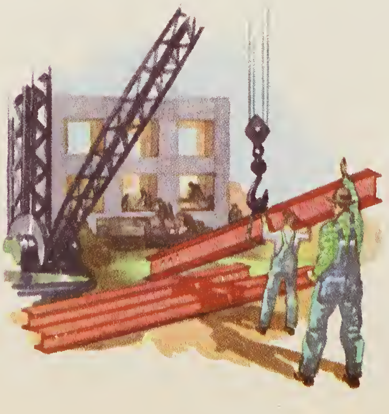


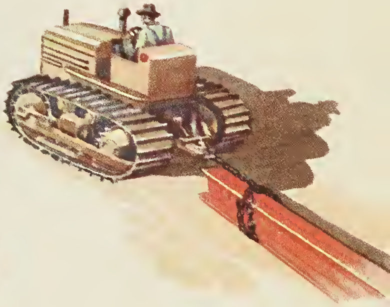


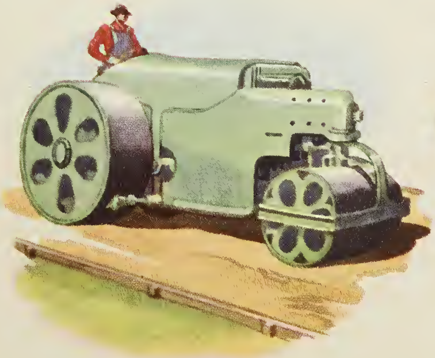
Machines and Motors

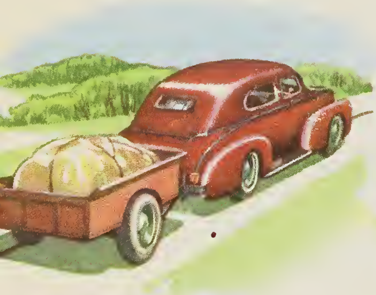




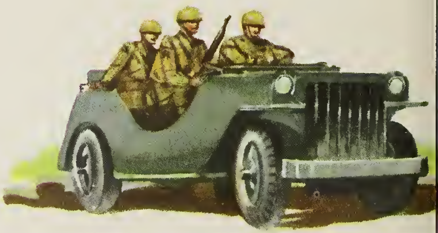


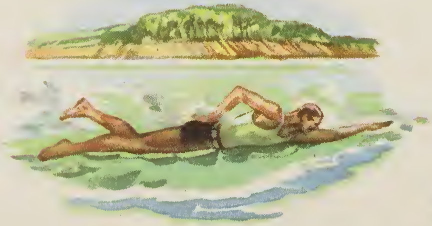




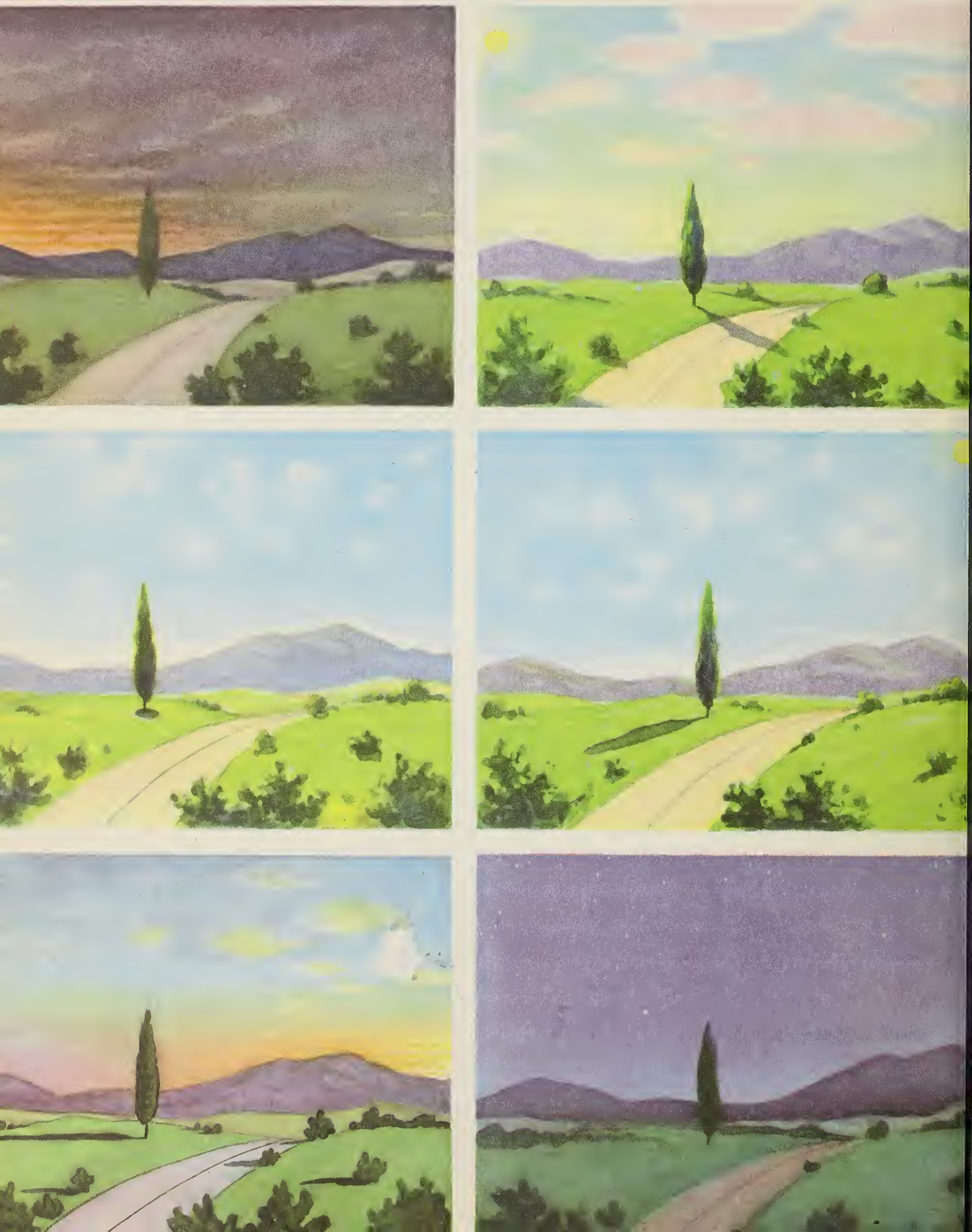


ICE CREAM

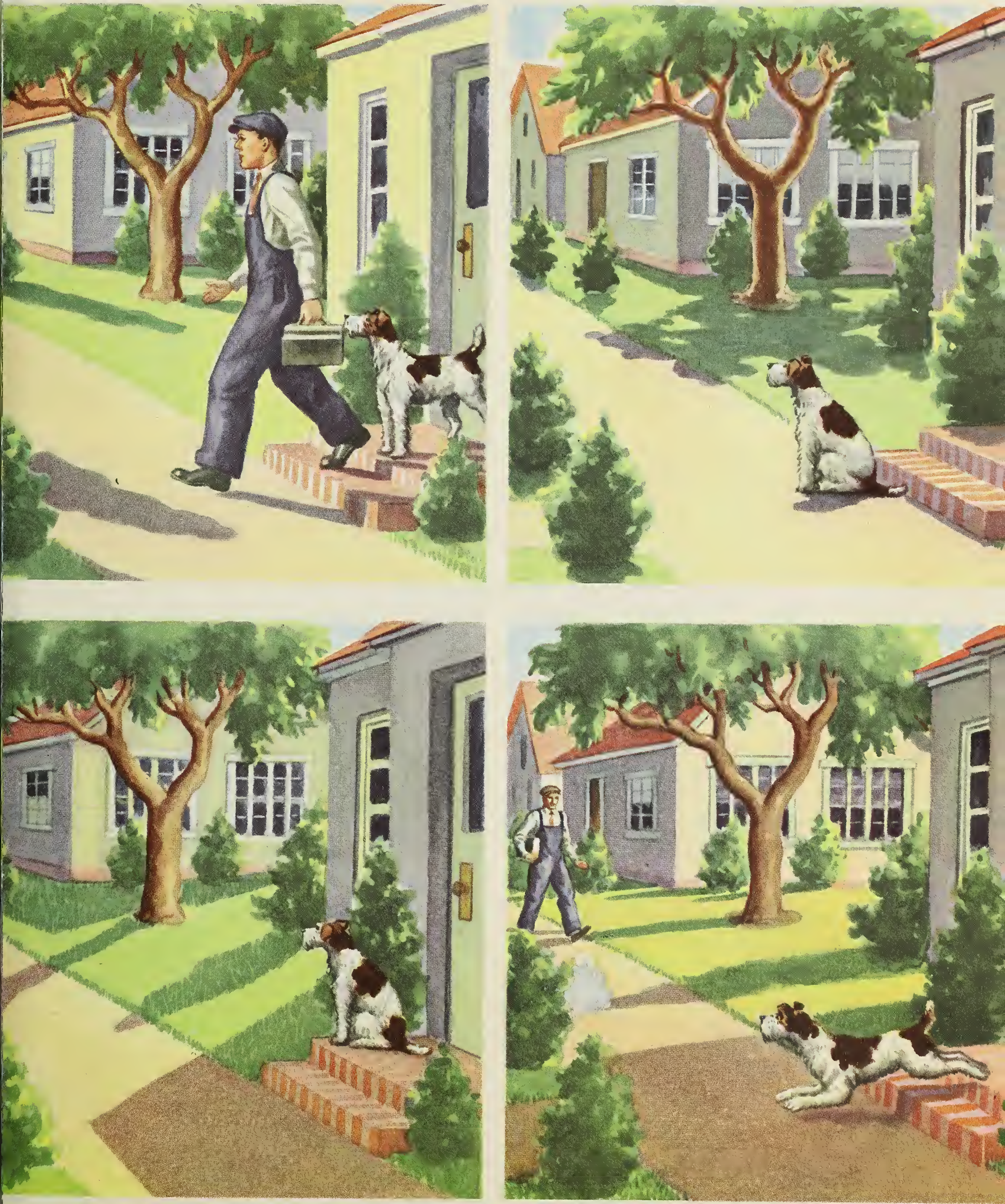




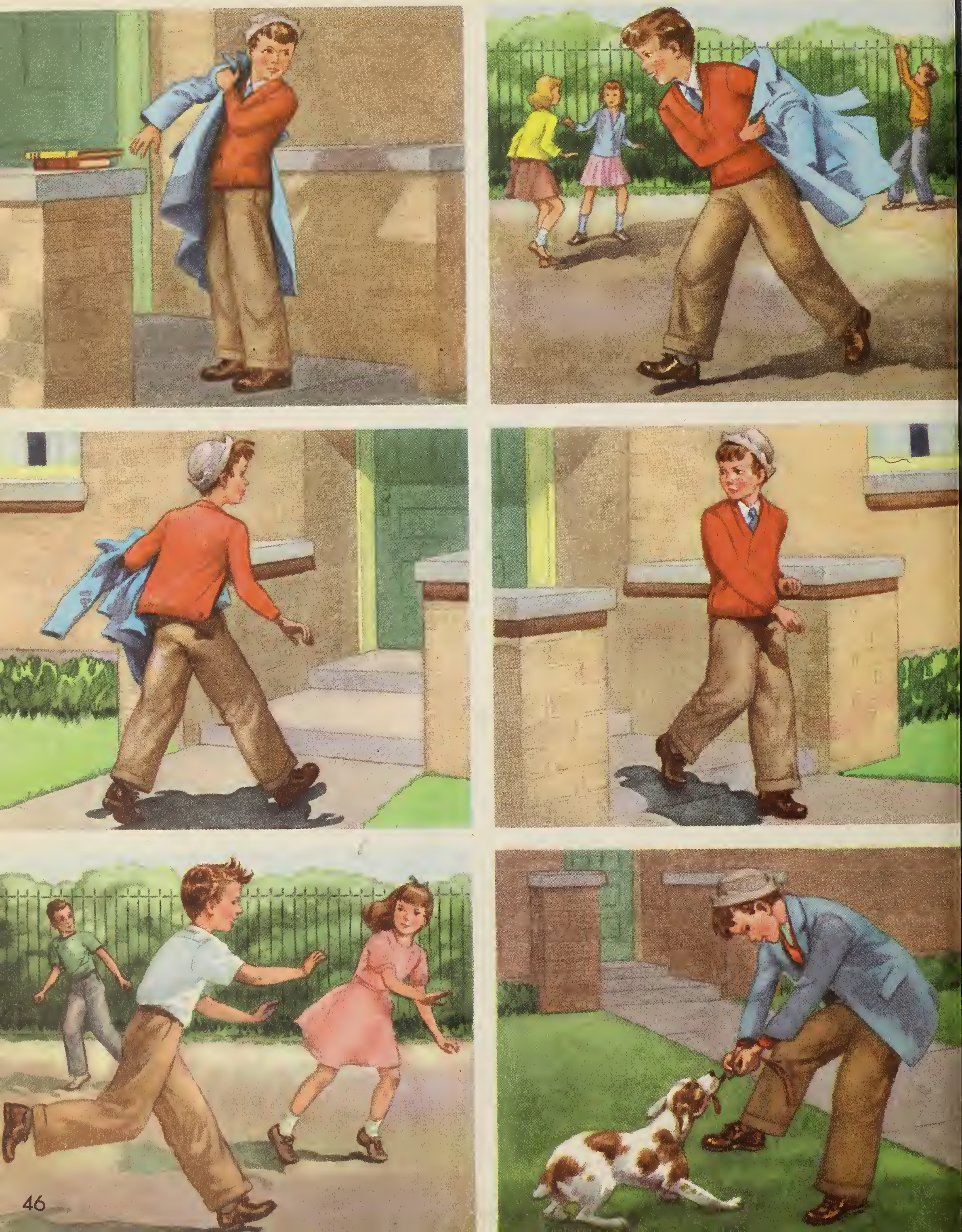
Sun Time



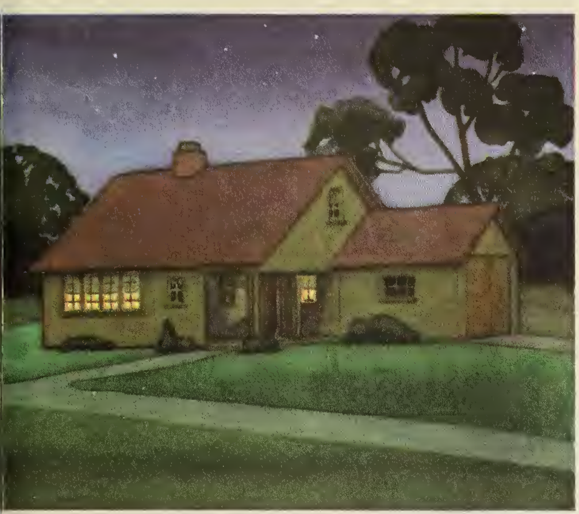
Do Shadows Help Tell Time?

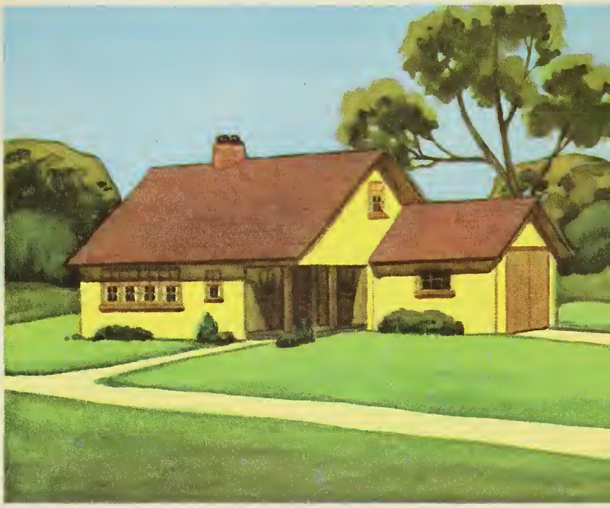


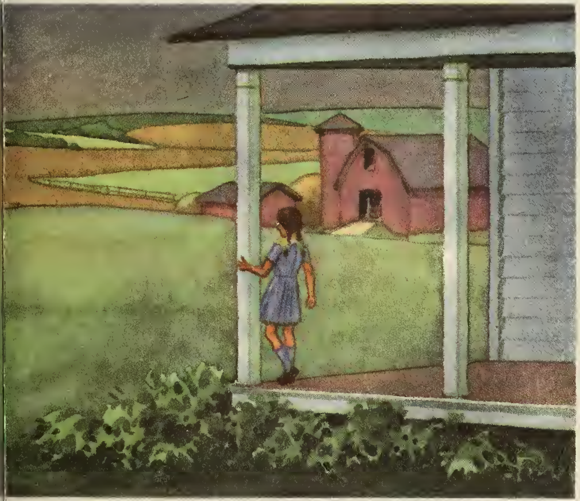
On and Off

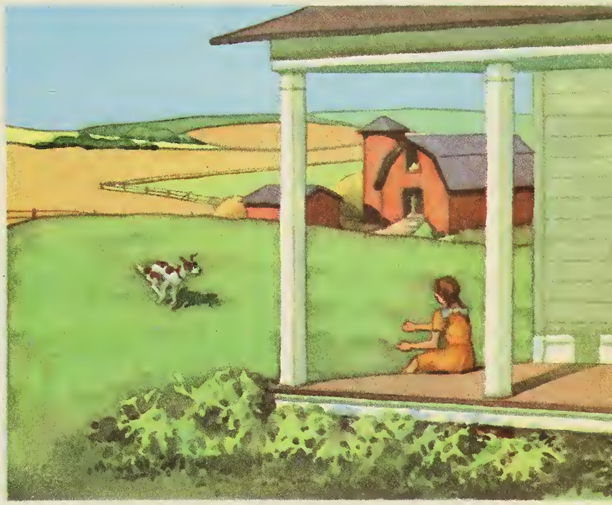


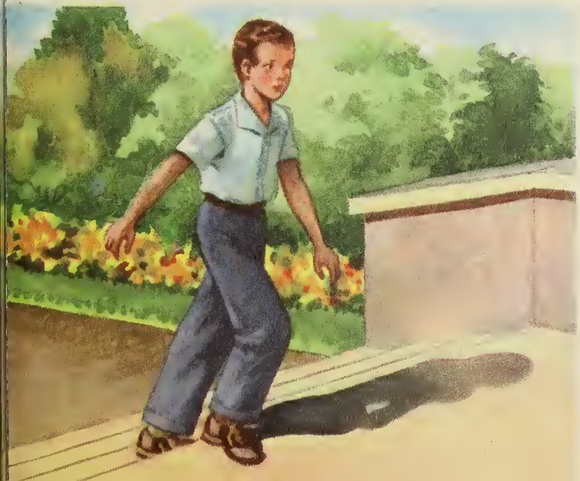
Which Is Warmer?

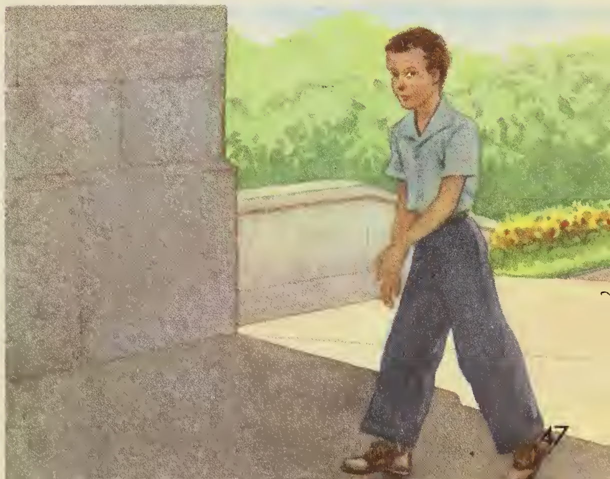






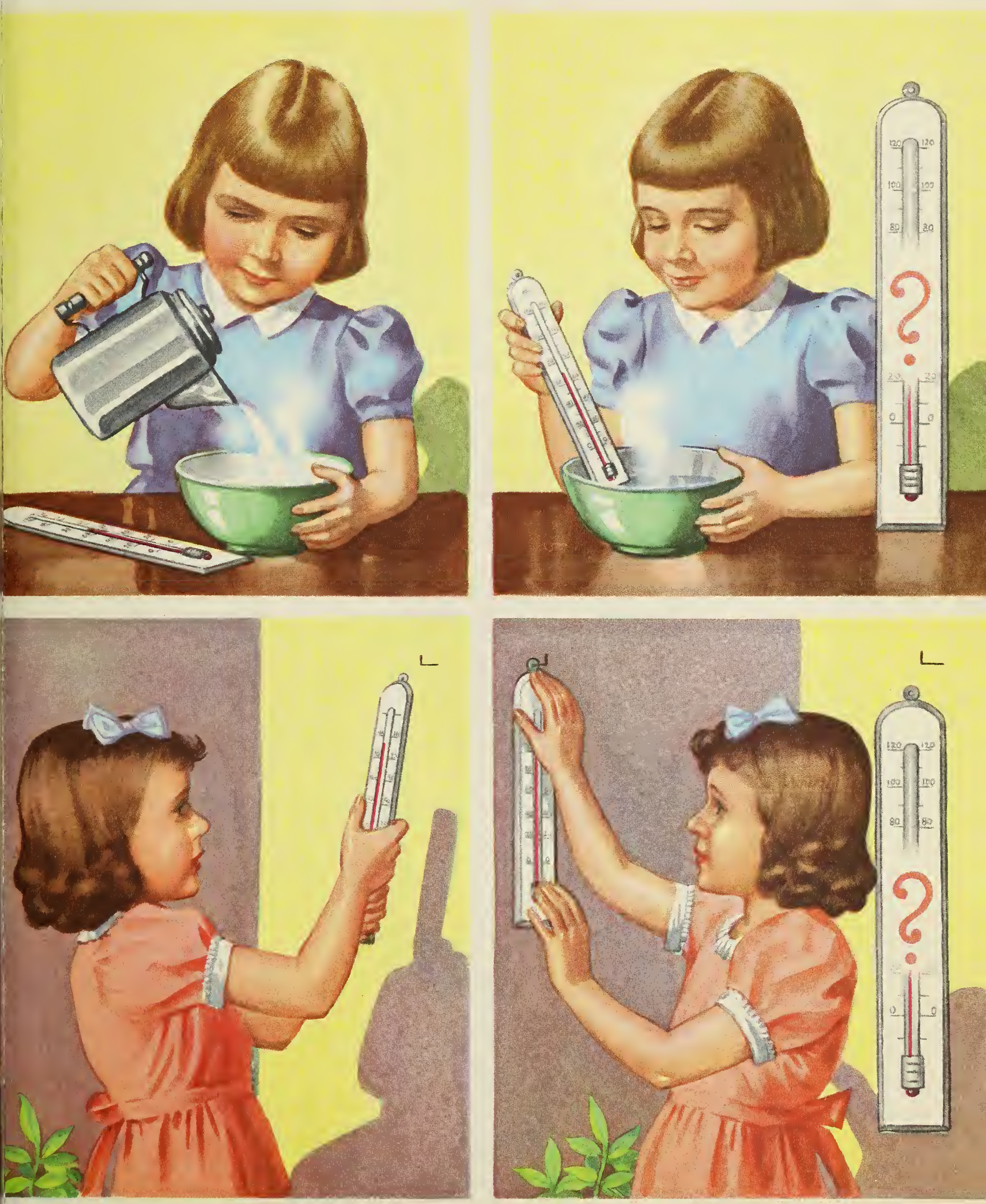


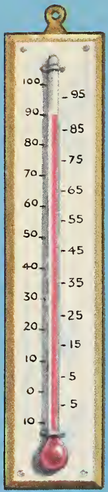


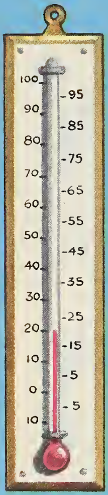


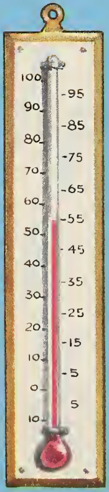
How Does a Thermometer Work?

What Will Happen?



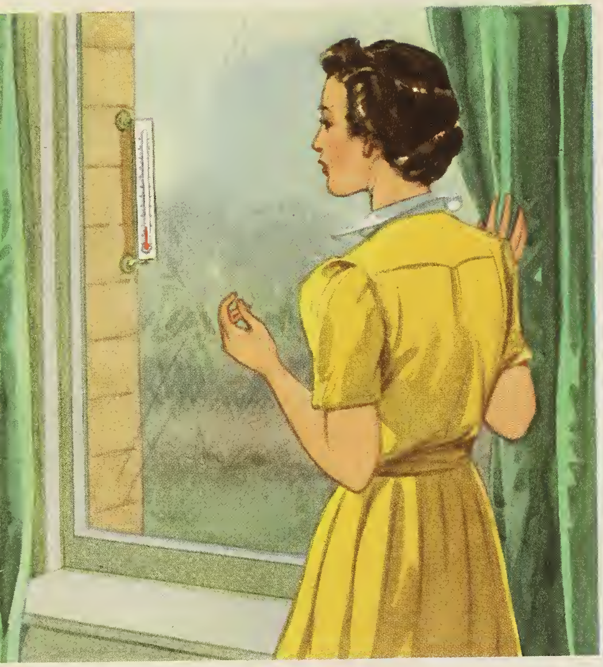

100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
5
10

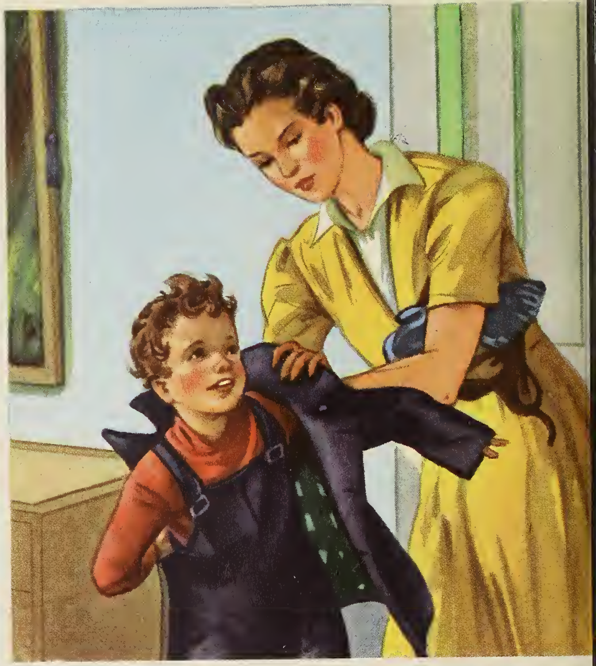

100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
5
10

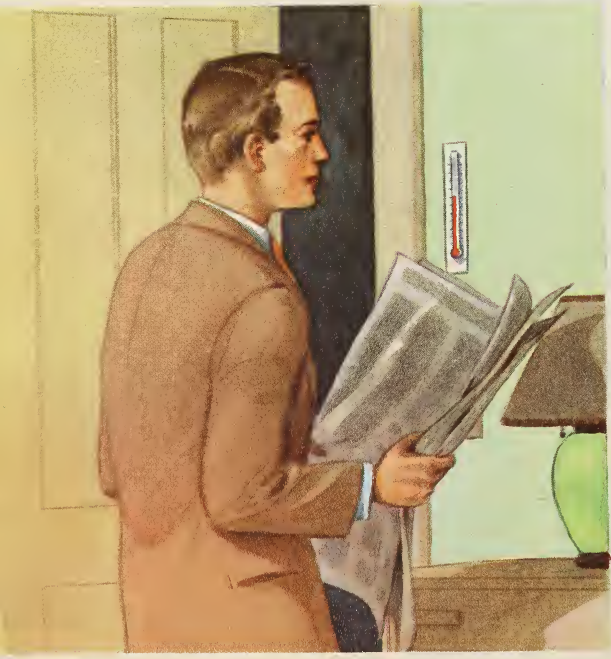

100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
5
10

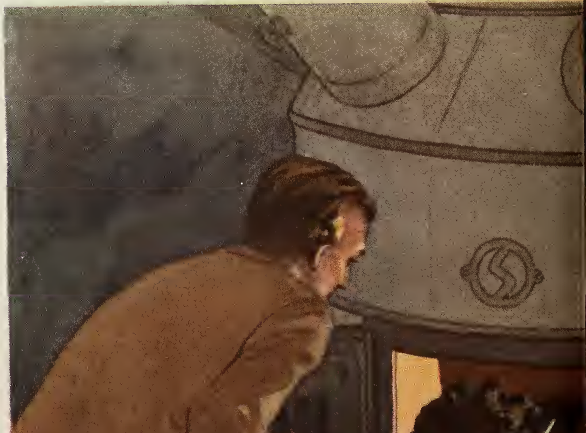
LEMONADE
5¢ GLASS

Why?

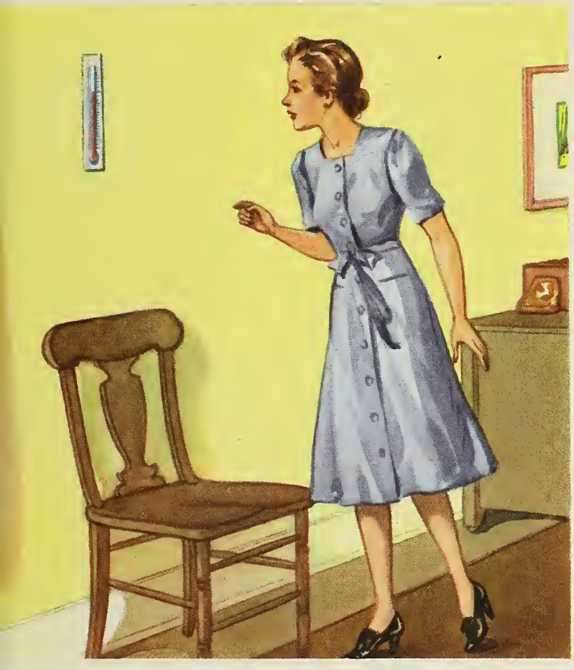


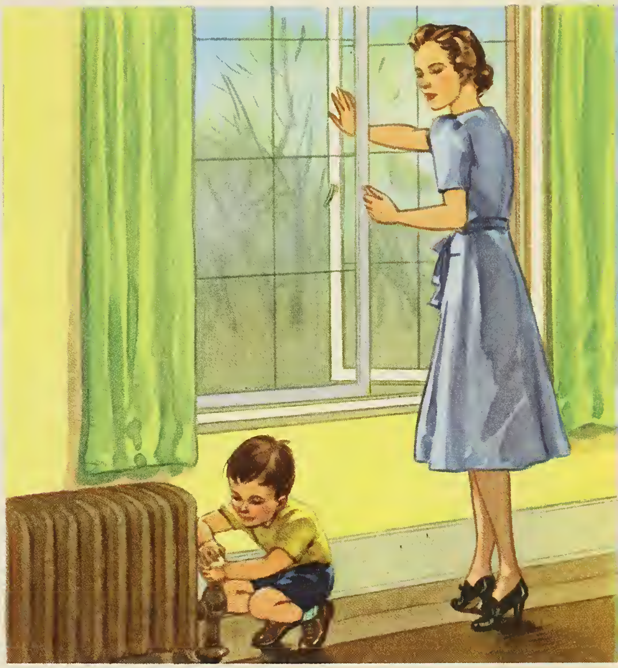


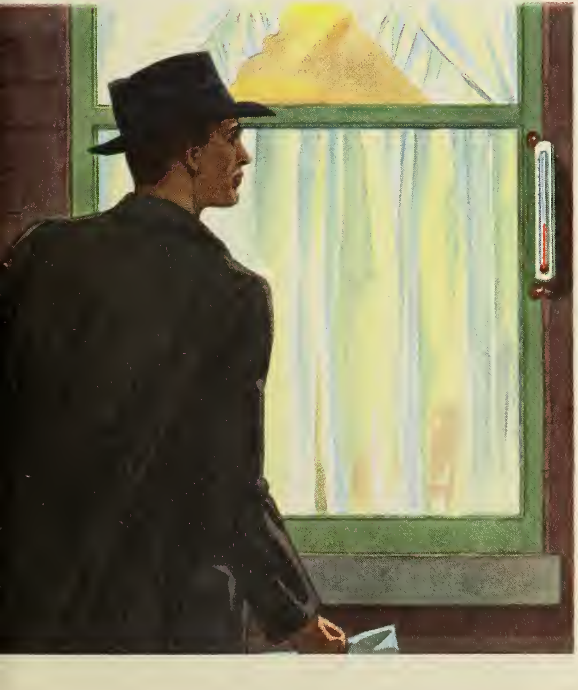


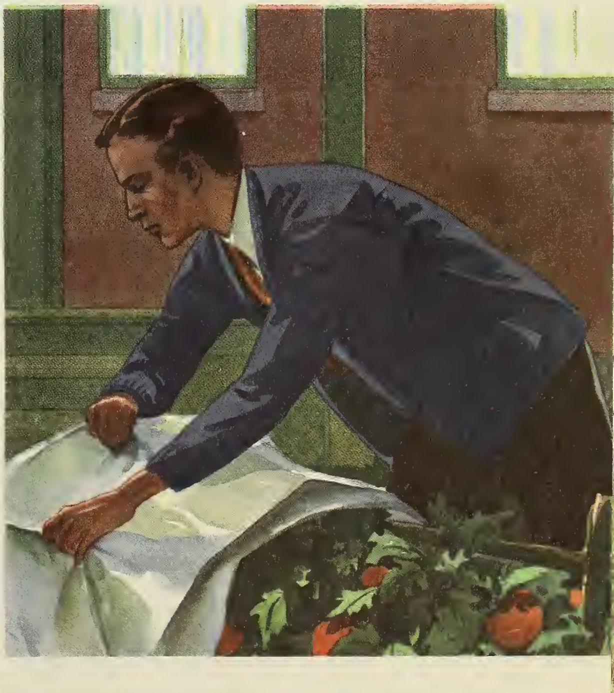


Why?

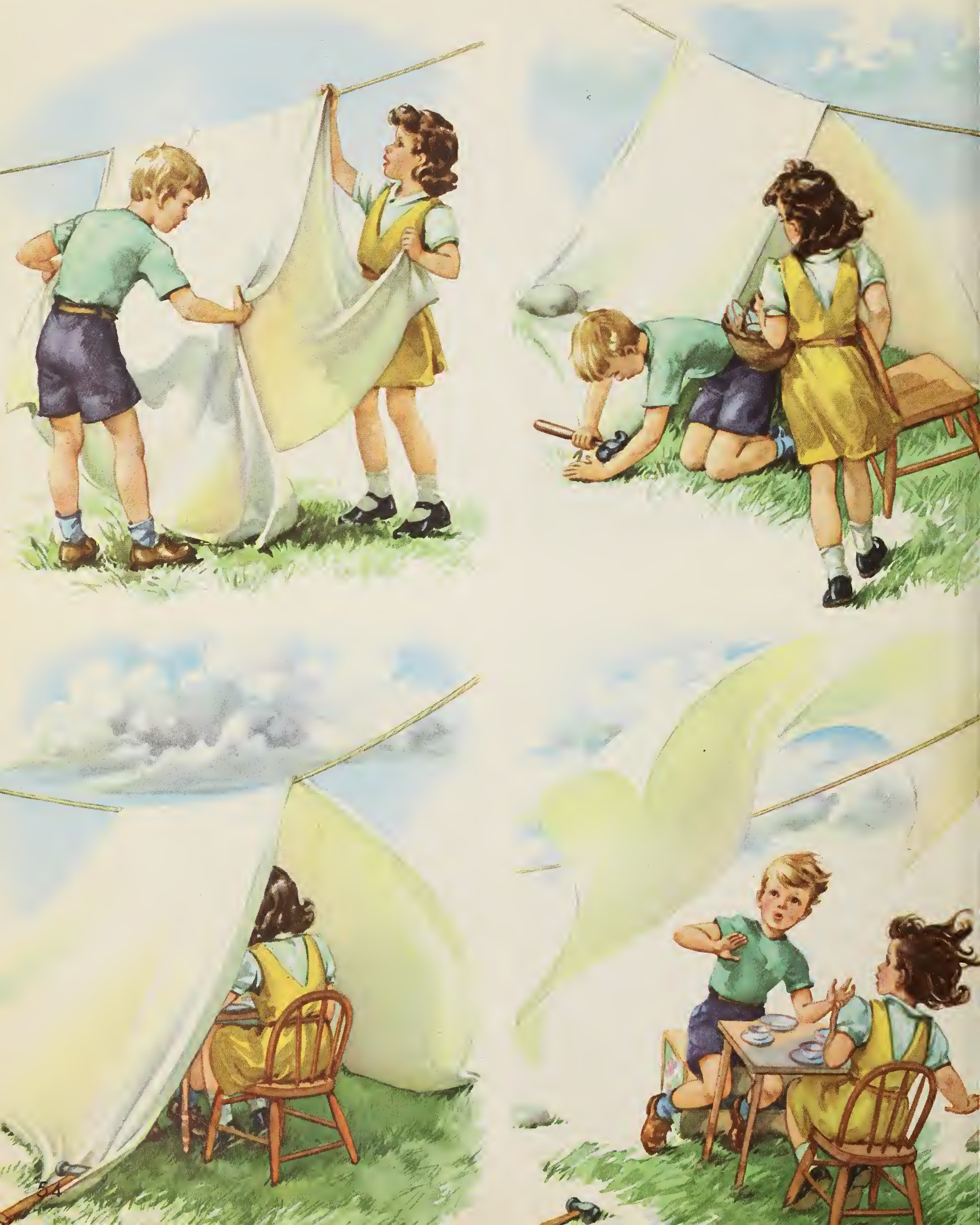




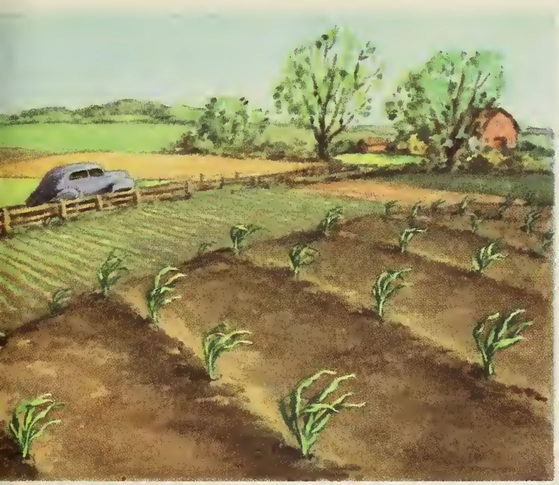


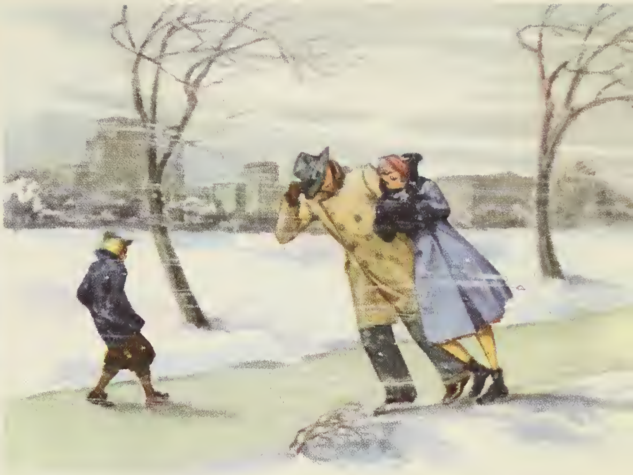


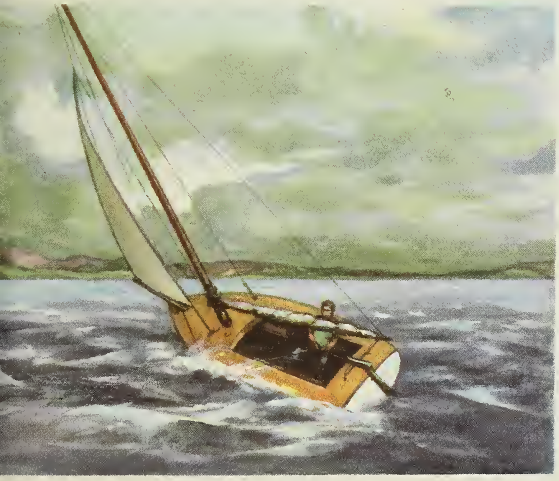
A Surprise

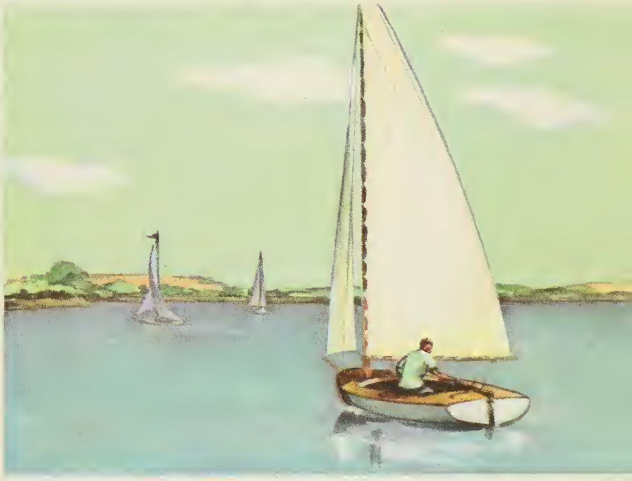


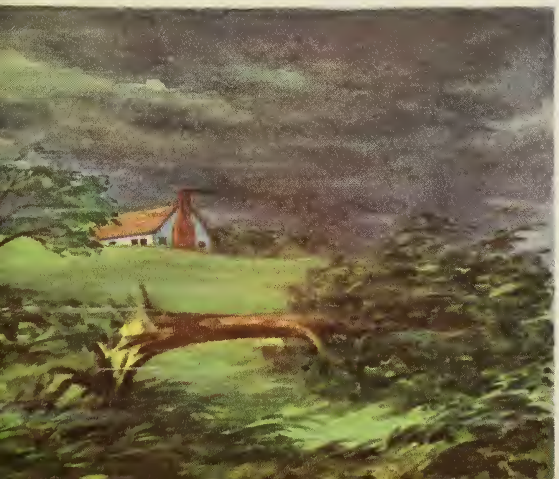
How Strong Is the Wind?

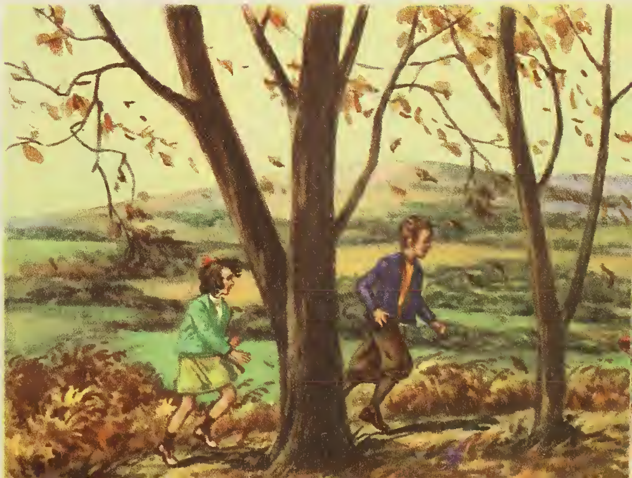






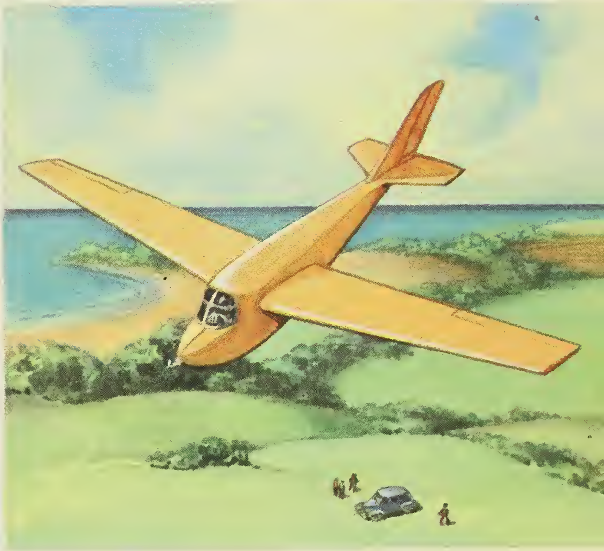




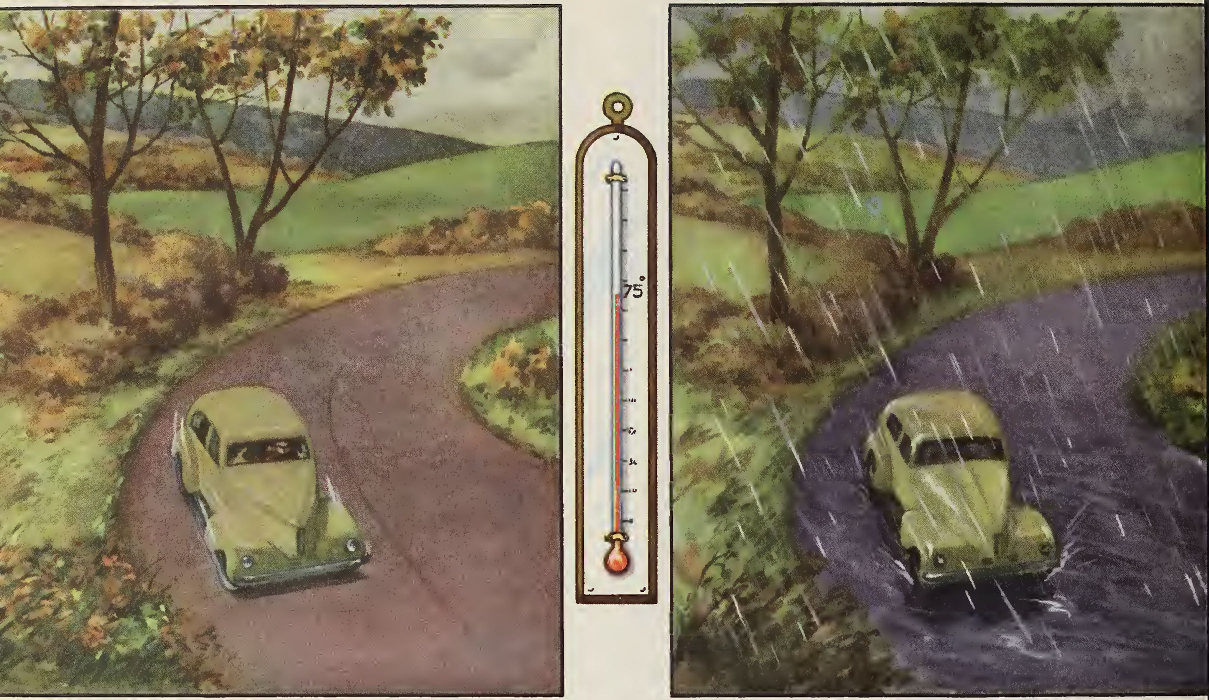


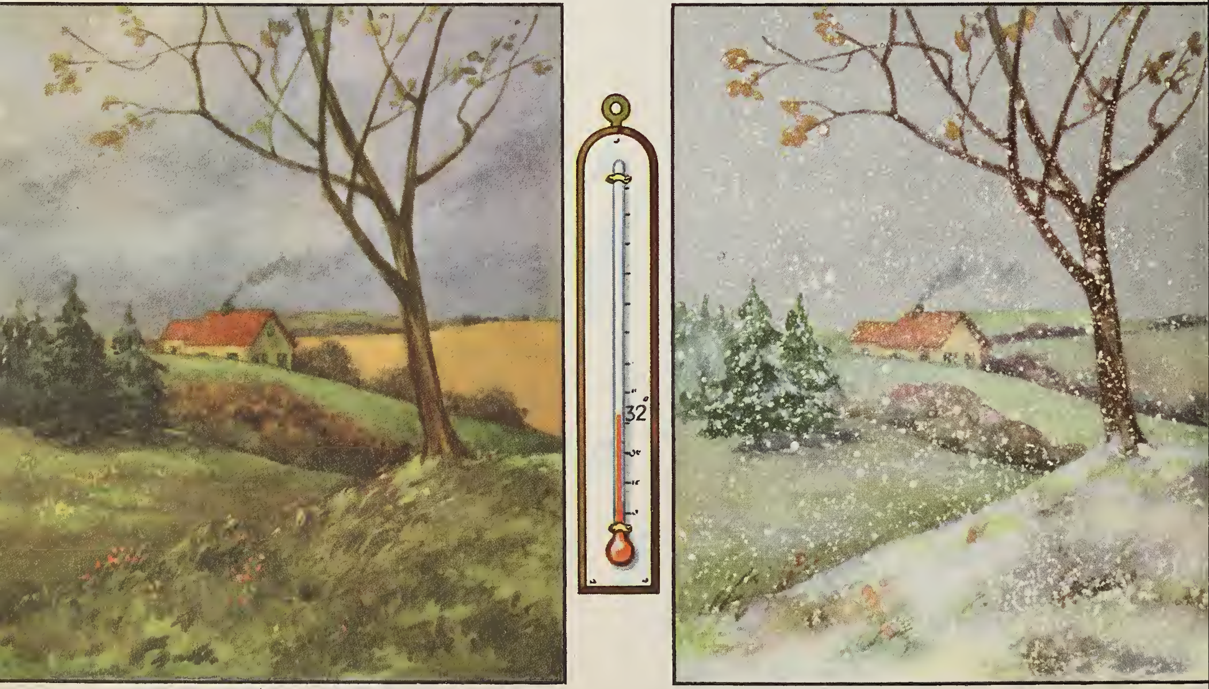
Wind is a helper

Wind is an enemy

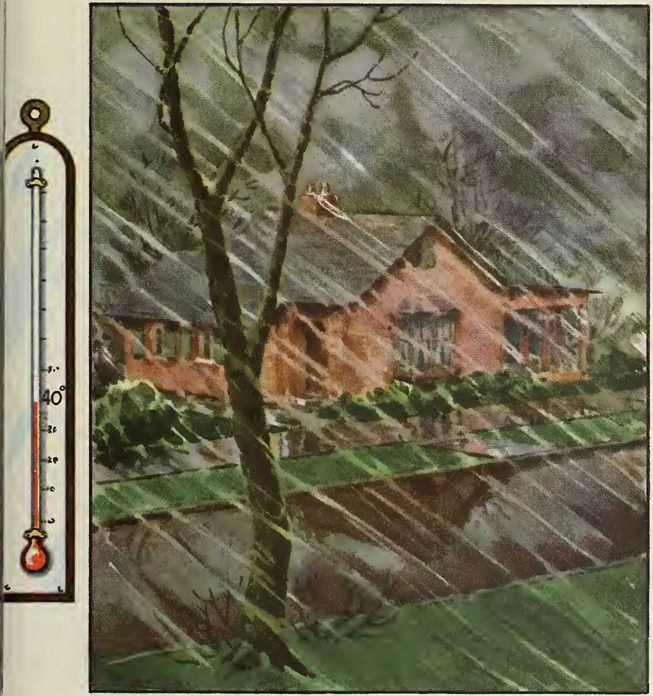


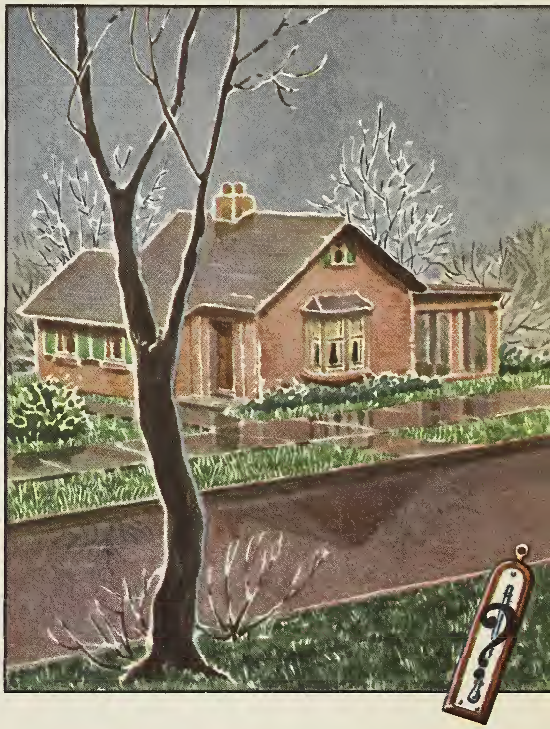
Storm Clouds

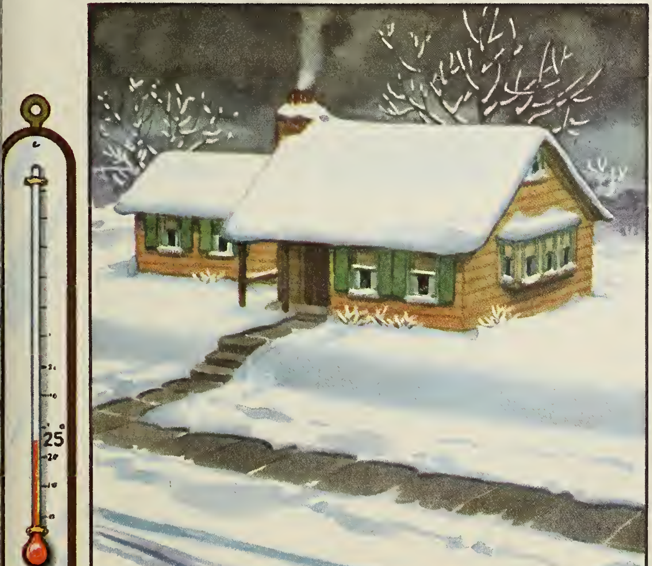


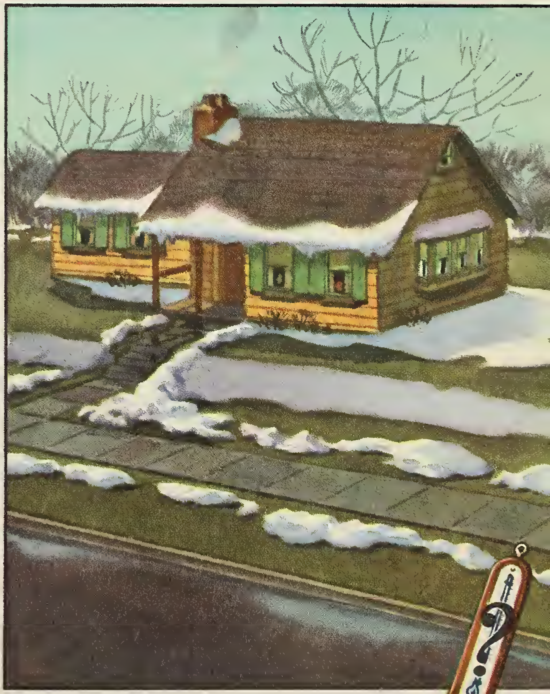


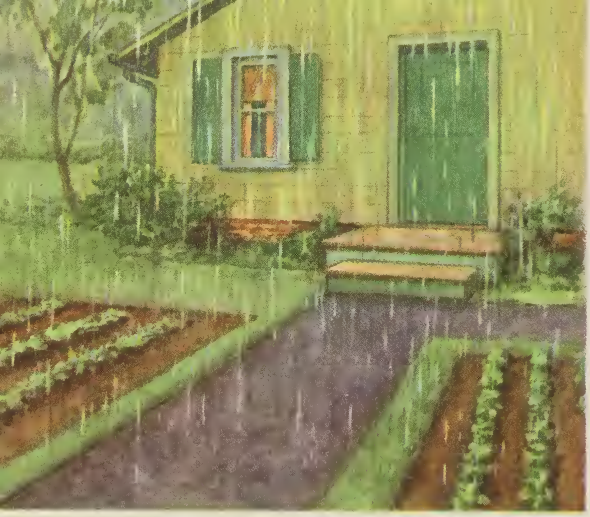
What Happened?

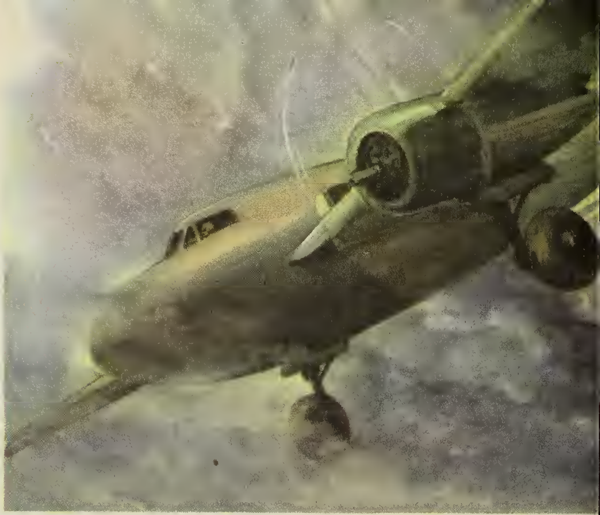


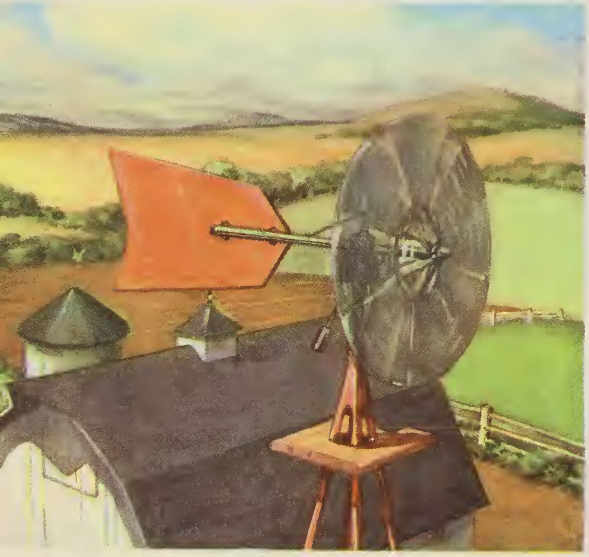


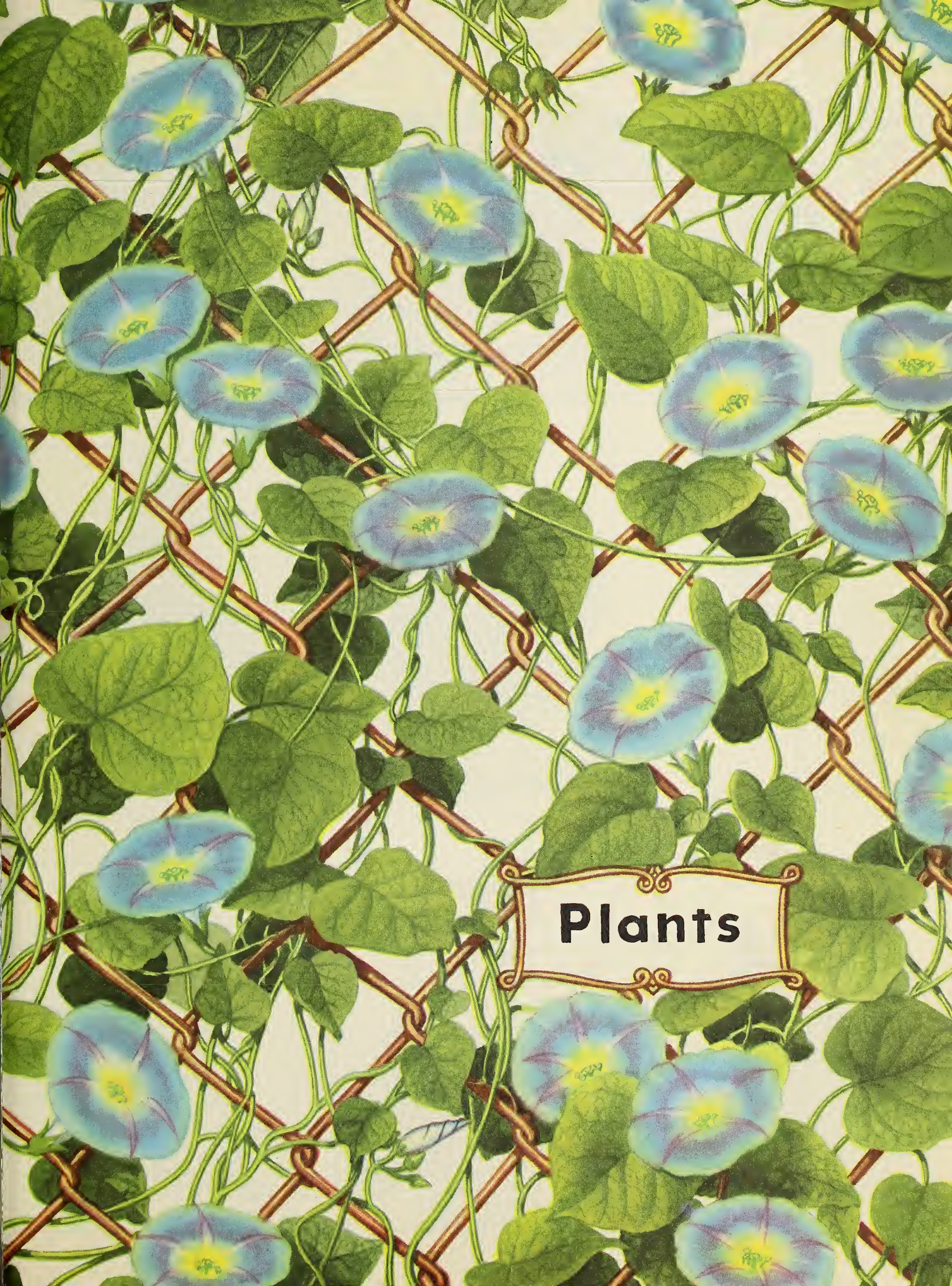




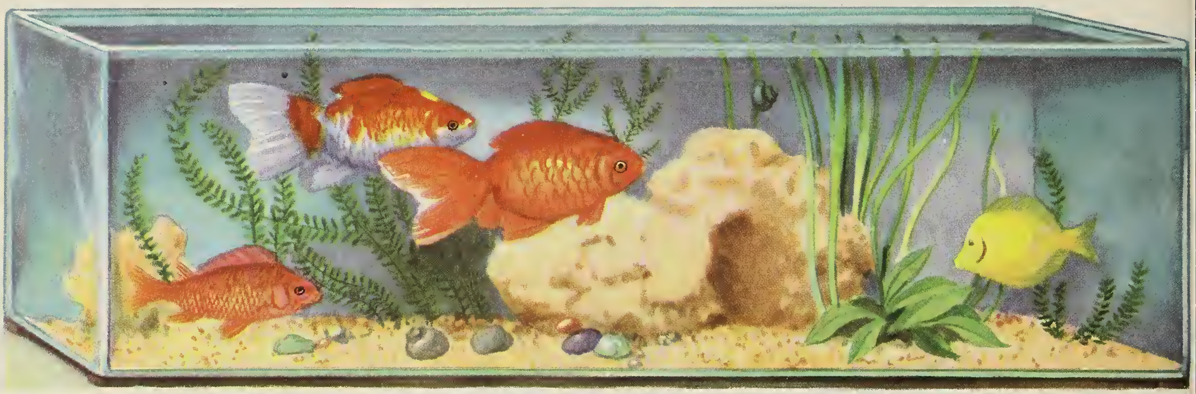


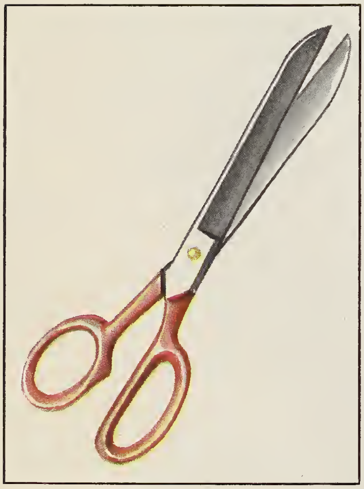


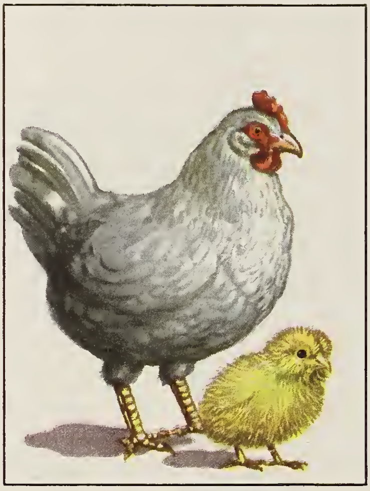


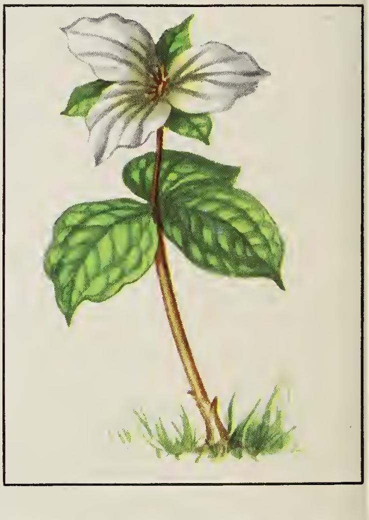

Plants

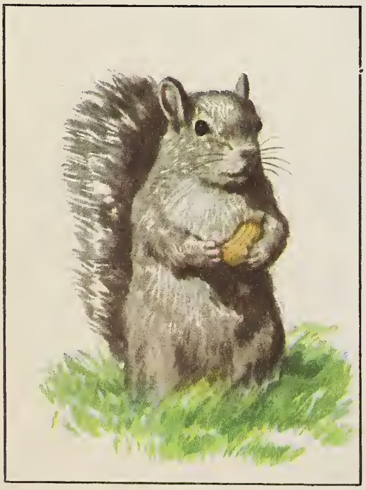
Which Ones Are Alive?

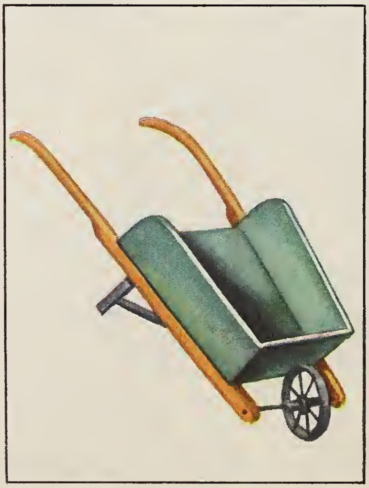


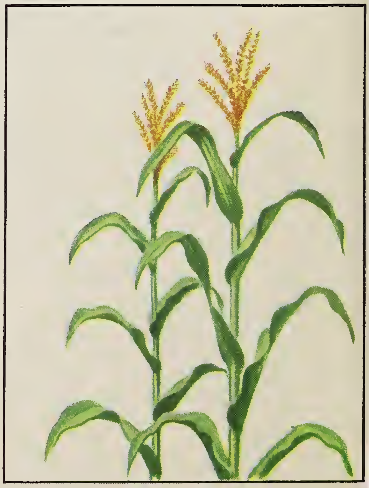


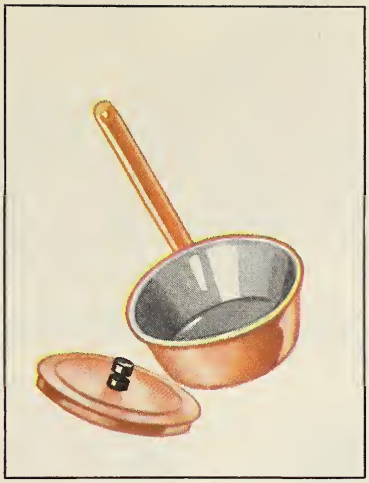


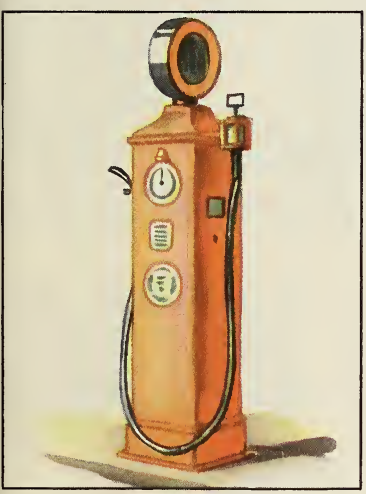


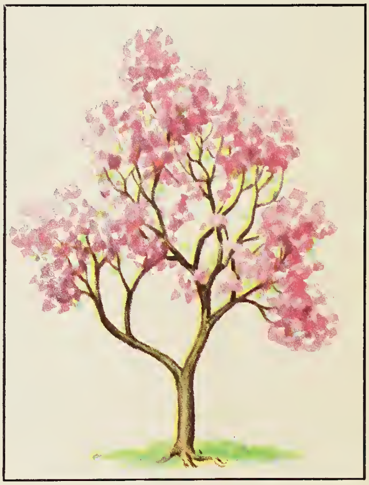


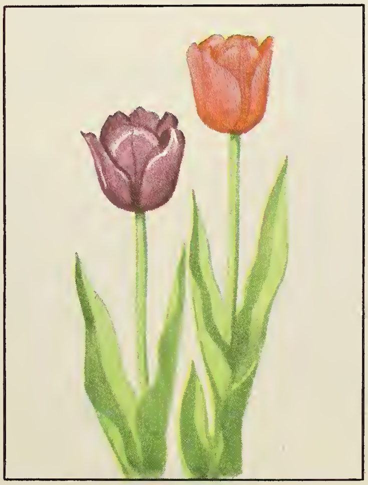
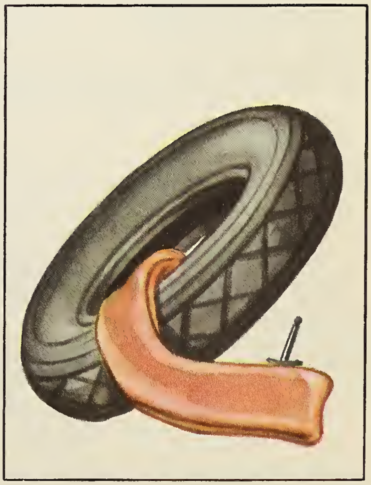




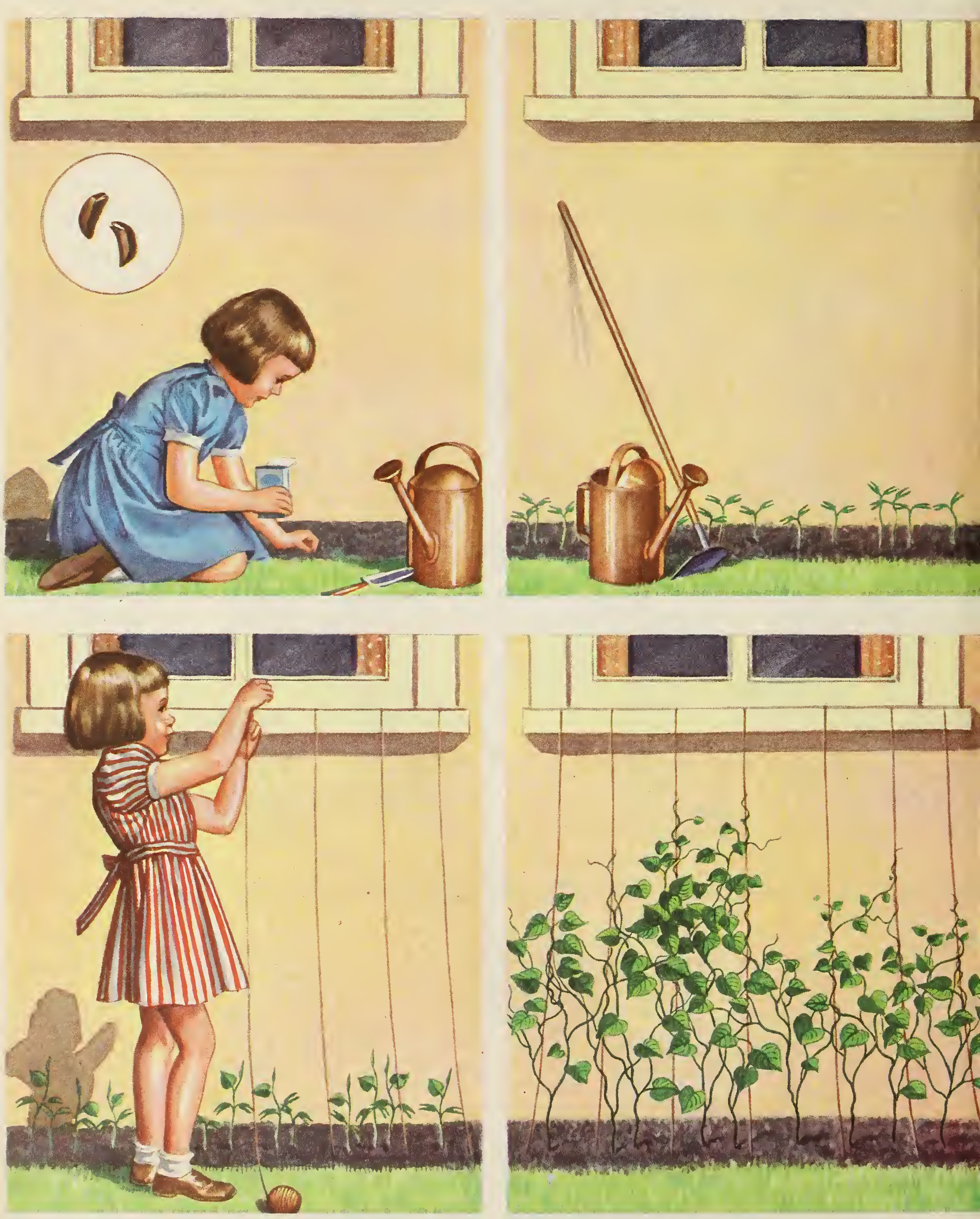


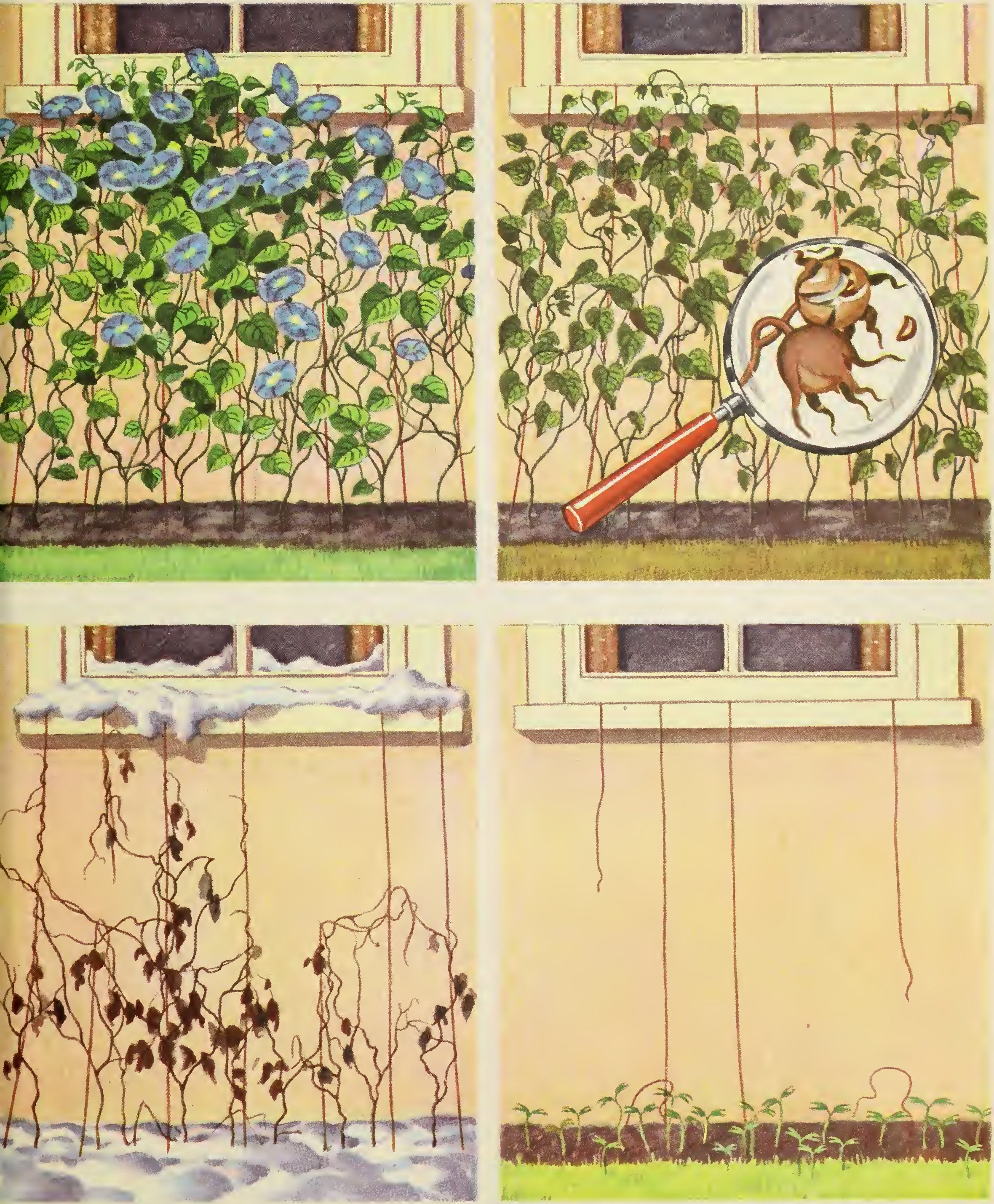


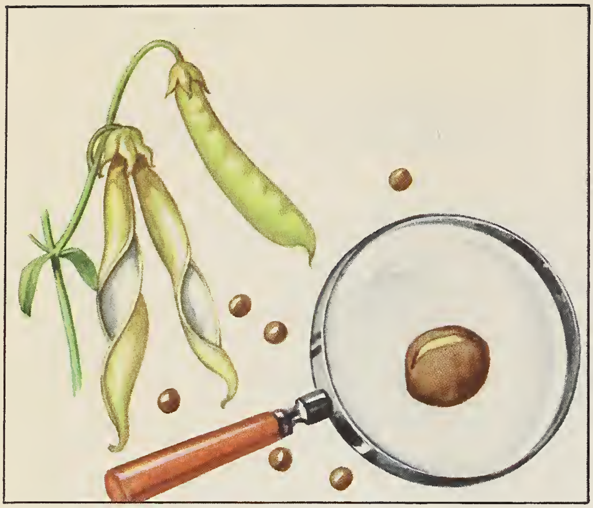


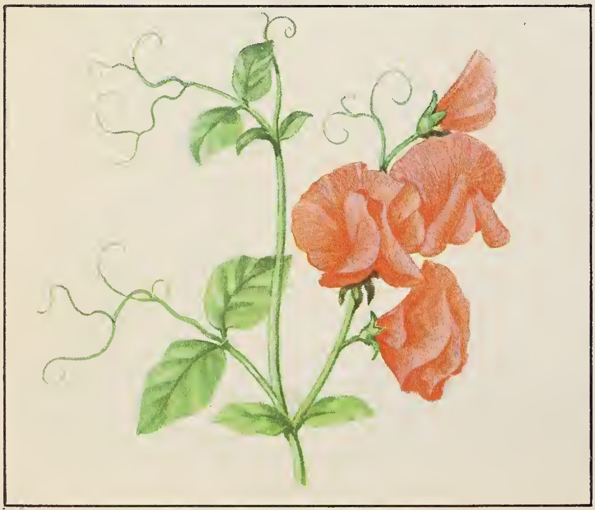



Plants Grow Up

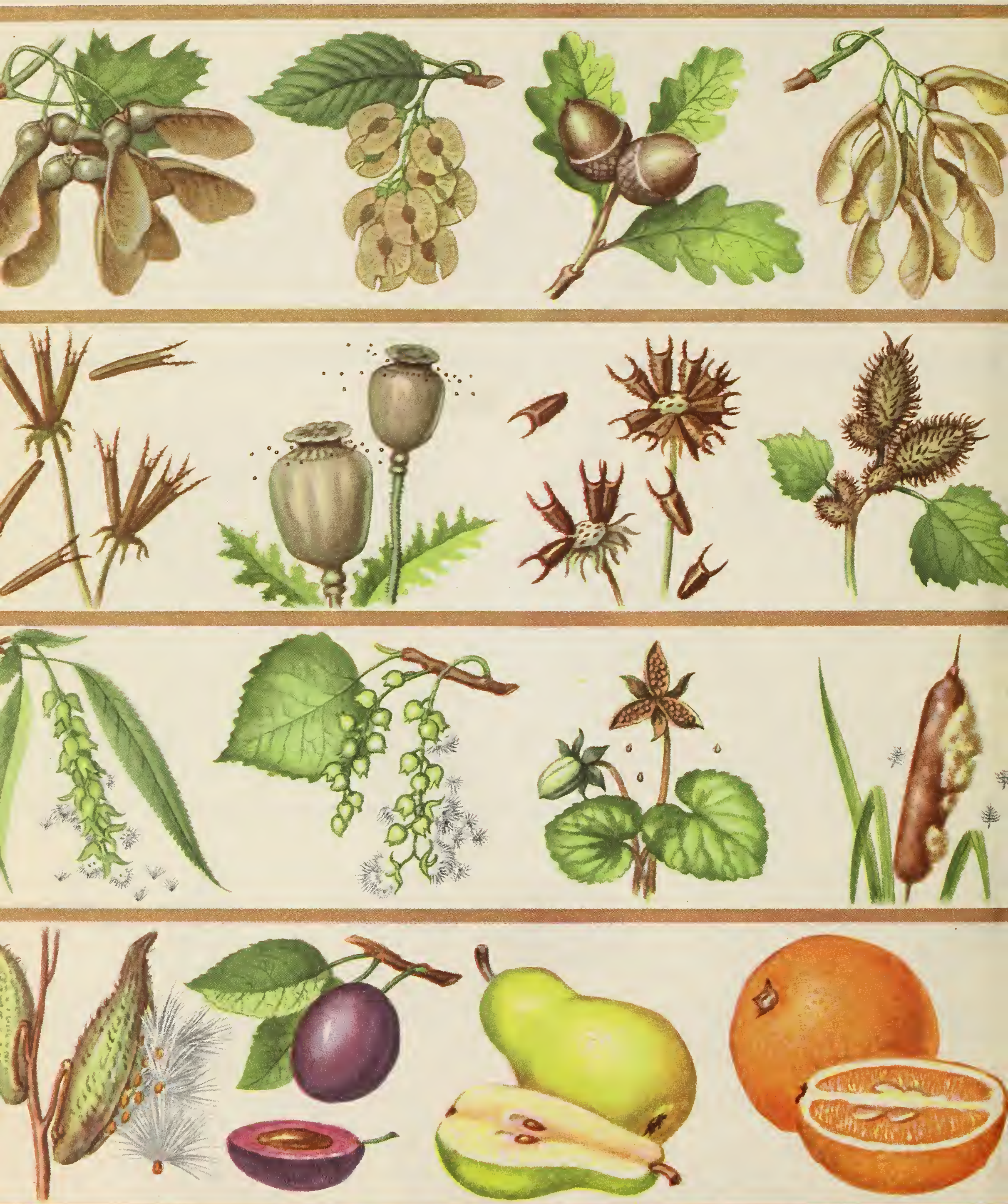




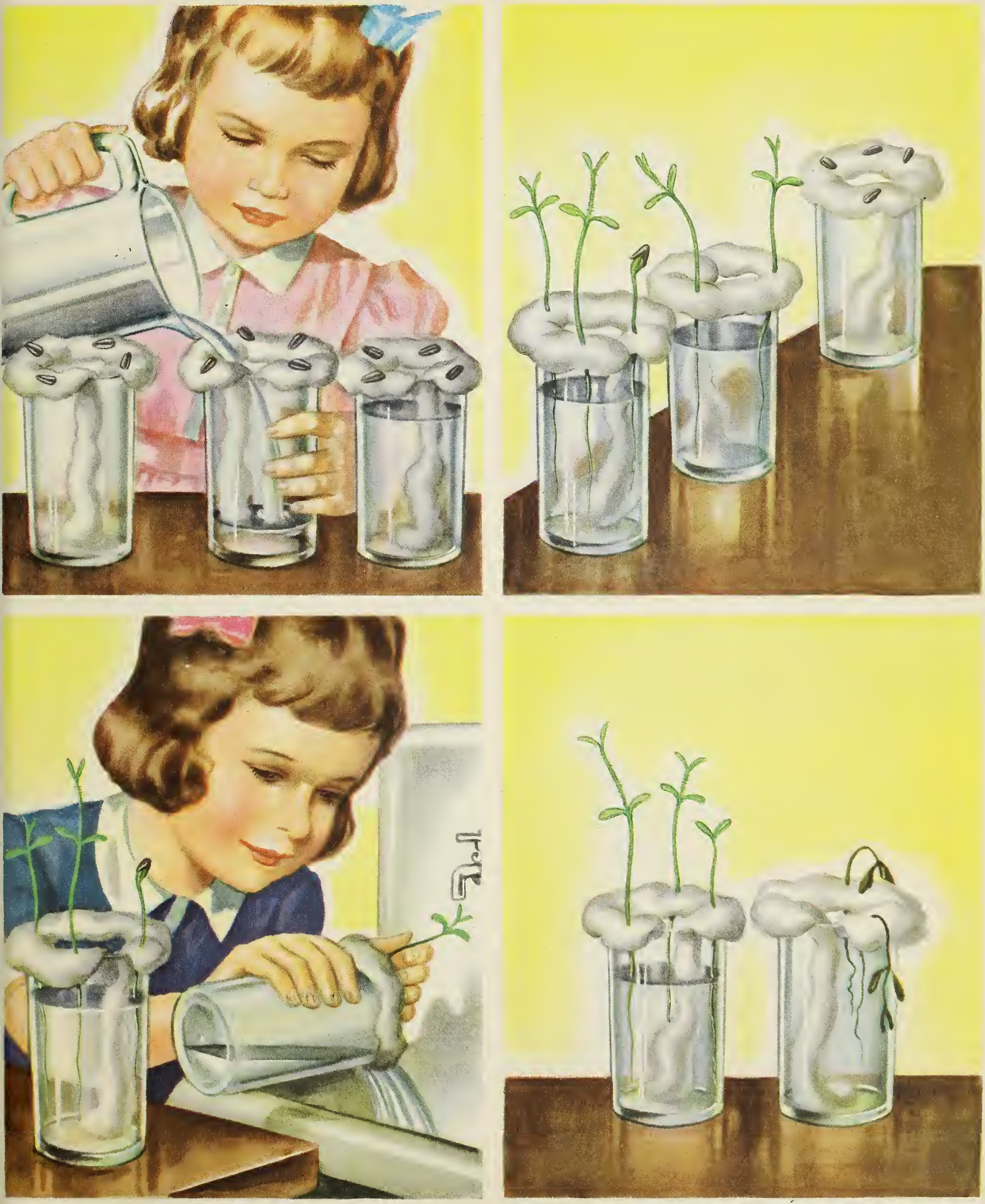




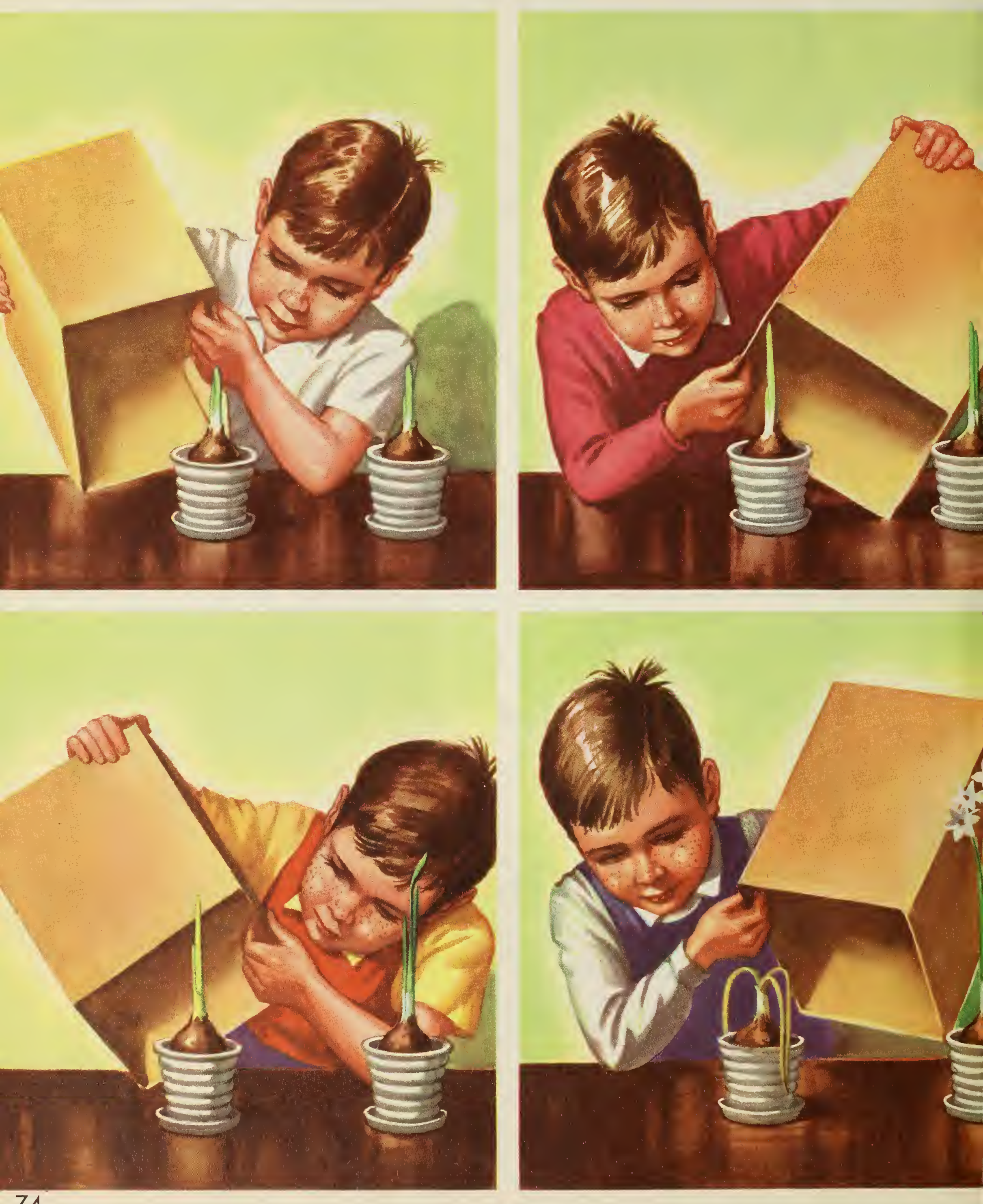
How Seeds Are Scattered

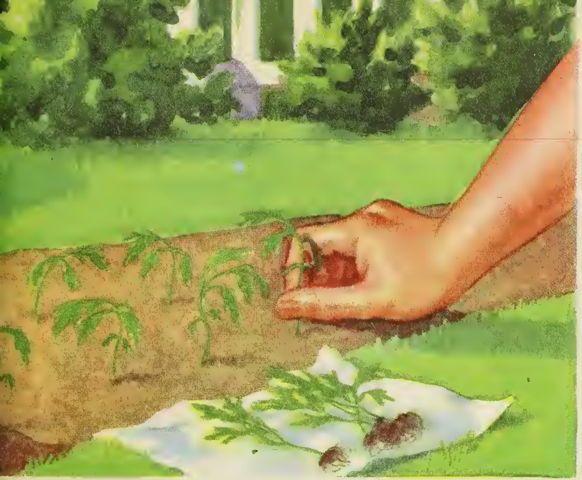


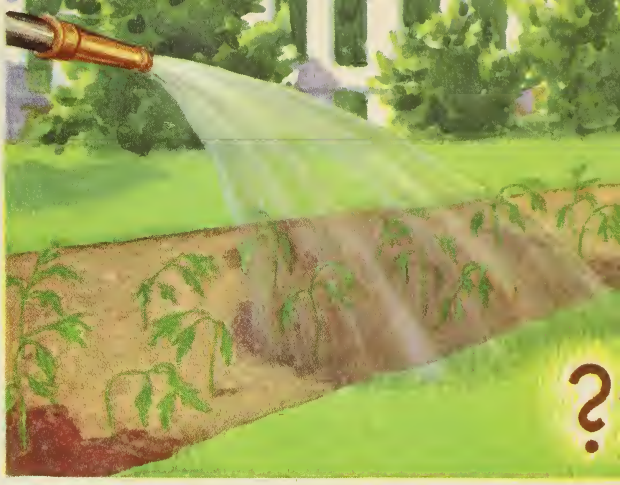
Do Plants and Seeds Need Water?

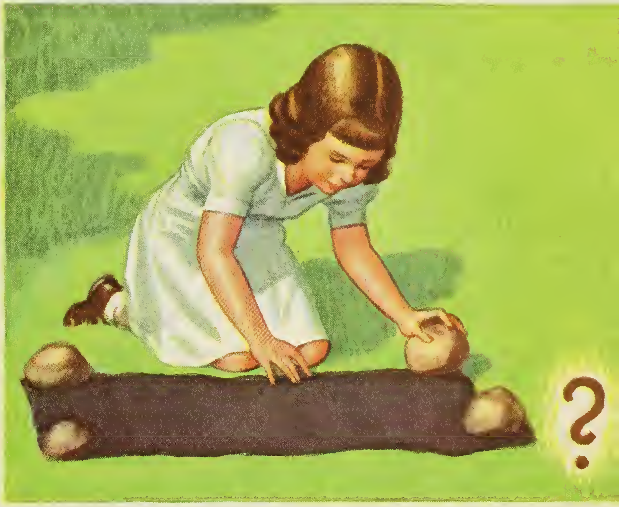


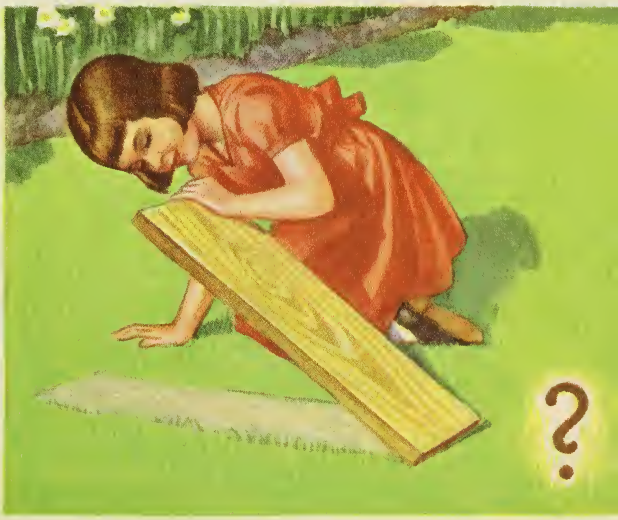
Do Plants Need Light?



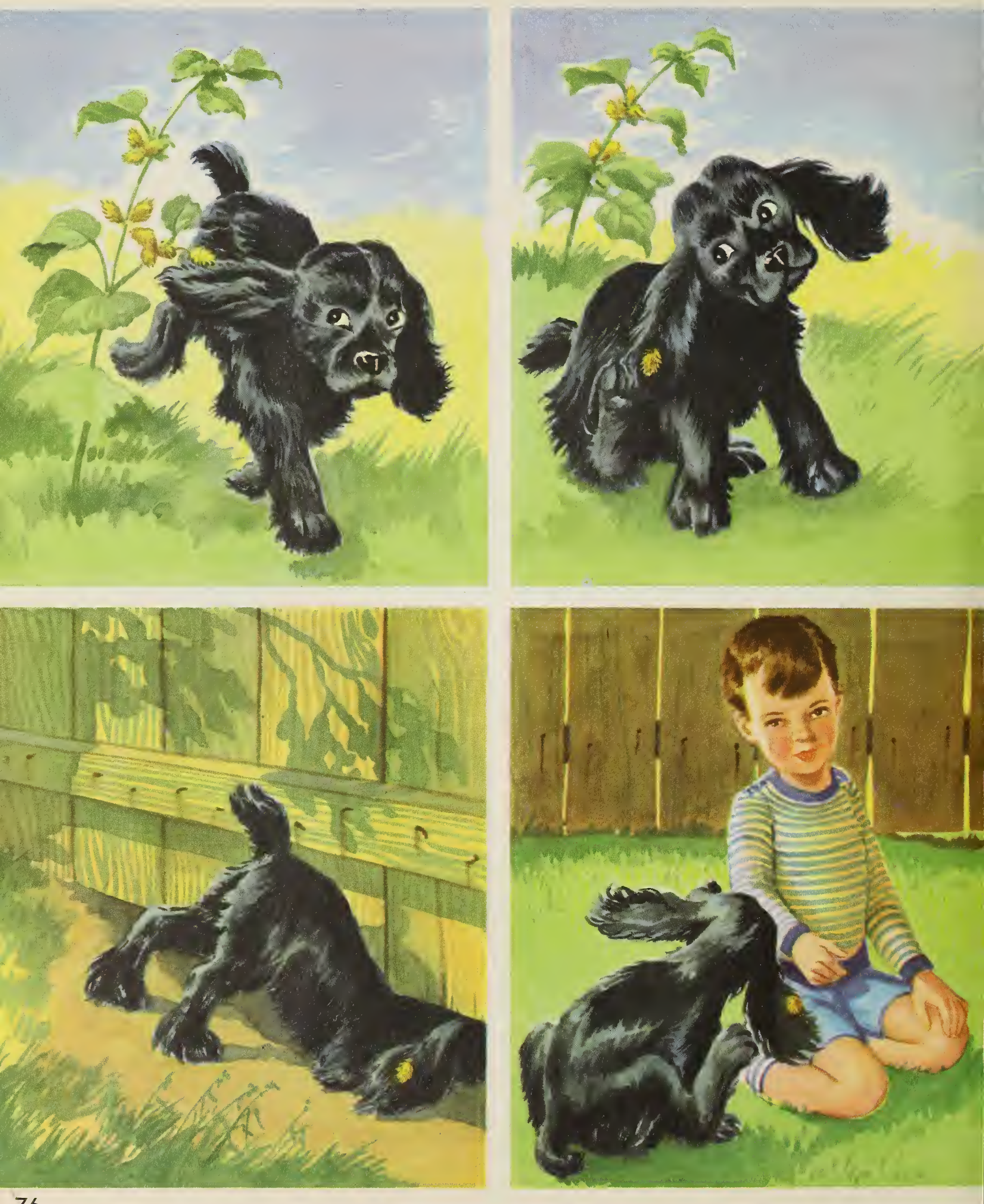


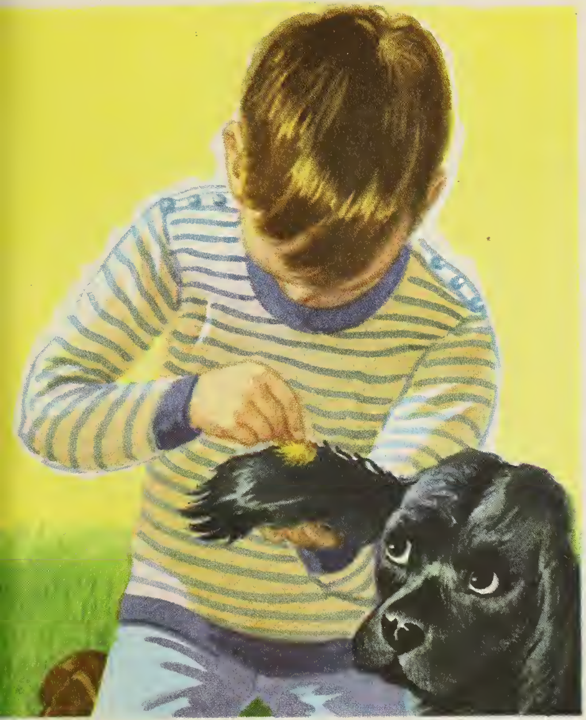


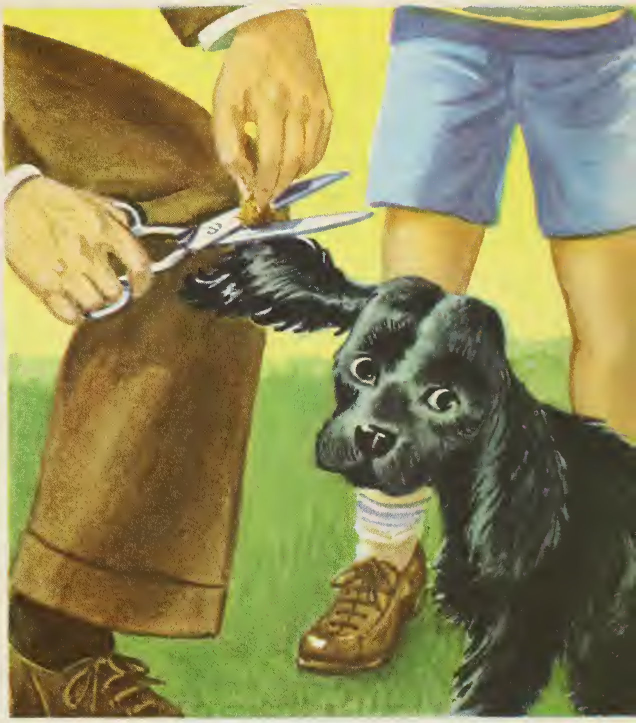


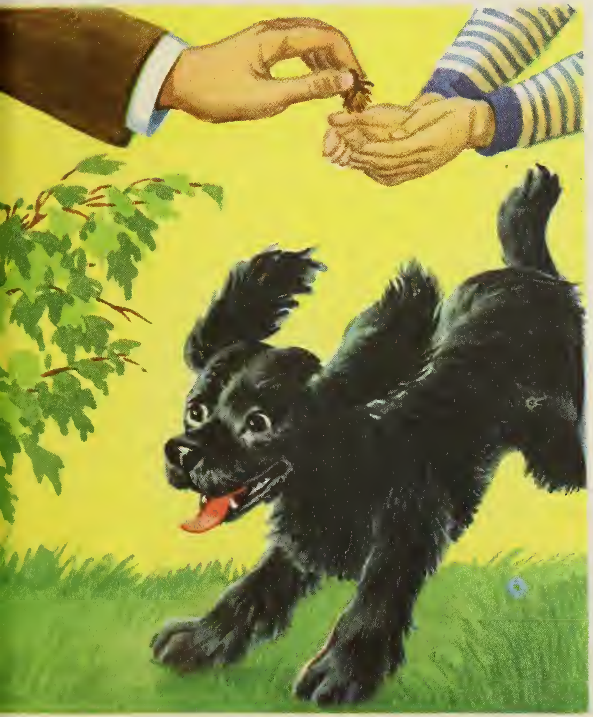


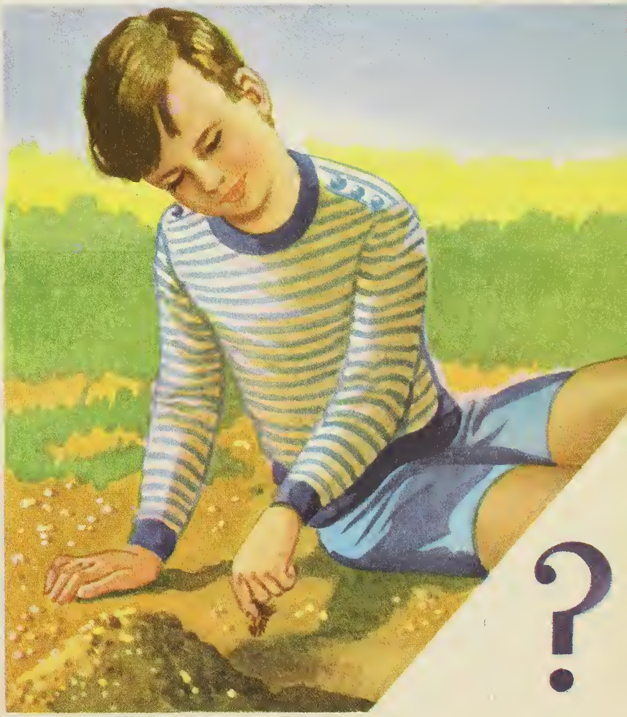
A Traveling Seed











?

Index to Concepts

Pages that promote readiness for a concept are printed in *italics* in the index. Pages that present developmental treatment of a concept are printed in **boldface**. Pages that provide for extension, enrichment, and application of concepts are printed in roman type.

UNIT I: Animals

A. Animals may be classified into groups according to their general physical characteristics.
   1. Birds have certain common distinguishing characteristics. Pages **6**, 11, 14, 15, 18, 19, 21, 24-25, 26-27.
      a. Their bodies are covered with feathers. Pages **6**, 11, 14, 15, 18, 19, 21, 24-25, 26-27.
      b. They have two legs and two wings. Pages **6**, 11, 14, 15, 18, 19, 21, 24-25, 26-27.
   2. Insects have certain common distinguishing characteristics. Pages **7**, 13, 24-25, 26-27.
      a. They have six legs. Pages **7**, 13, 24-25, 26-27.
      b. They have two feelers or antennae. Pages **7**, 13, 24-25, 26-27.
   3. Mammals have certain common distinguishing characteristics. Pages *4-5*, **10**, 15, 20, 24-25, 26-27, 28.
      a. Mammals are born. Pages *4-5*, **10**, 15, 20, 24-25, 26-27, 28.
      b. Mammals have hair on their bodies. Pages *4-5*, **10**, 15, 20, 24-25, 26-27, 28.
      c. Baby mammals get milk from the mother's body. Pages *4-5*, **10**, 15, 20, 24-25, 26-27, 28.

B. Animals follow a definite pattern of growth.
   1. Some baby animals resemble the parents more than they resemble other animals. Pages *4-5*, **8-9**, 10, 11, 14, 15, 18, 19, 20, 24-25, 26-27, 28.
   2. Baby animals that do not resemble the parents resemble them at maturity. Pages **12**, 13, 14, 15, 23, 26-27.
   3. Some animals are born. Pages *4-5*, **10**, 15, 20, 24-25, 26-27, 28.
   4. Some animals are hatched. Pages **11**, 12, 13, 14, 15, 18, 19, 23, 26-27.
   5. Some animals pass through stages of structural change before maturity is reached. Pages **12**, 13, 14, 15, 23, 26-27.
   6. Animals change in their ability to do things as they grow older. Pages *4-5*, **10**, 11, 12, 18, 20, 22, 24-25, 26-27, 28.

C. Animals must have food to live and grow.
   1. Some baby animals eat the same kind of food as the parents. Pages **18**, 19, 21, 23, 24-25, 26-27.
   2. Baby mammals get milk from the mother's body. Pages *4-5*, **10**, 15, 20, 24-25, 26-27, 28.
   3. The ability to move about is important in food getting. Pages *4-5*, **10**, 11, 16-17, 18, 19, 20, 21, 23, 24-25, 26-27, 28.
   4. Baby animals differ in ability to get their own food. Pages *10*, *11*, *18*, **19**, 20, 21, 23, 24-25, 26-27, 28.

D. Baby animals receive varying degrees of parental care and protection.
   1. Many baby animals get milk from the mother's body. Pages *4-5*, **10**, 15, 20, 24-25, 26-27, 28.
   2. Most baby animals that cannot move about competently are fed by the parents. Pages *4-5*, **10**, 11, 18, 20, 24-25, 26-27, 28.
   3. Many baby animals that cannot move about competently and cannot escape from enemies get protection from the parents. Pages *4-5*, *10*, *11*, *18*, **19**, 20, 21, 22, 26-27, 28.
   4. Some baby animals get no parental protection. Pages *12*, *13*, **23**, 24-25, 26-27.

UNIT II: Getting Work Done

A. When things are moved, work is done.
   1. There are many ways of doing work. Pages 29, 30-31, **33**, 34, 35, 36-37, 38-39, 40.
   2. Machines enable us to use our energy more efficiently. Pages 29, 30-31, **33**, 34, 35, 36-37, 38-39, 40.

B. We can move things with our own muscles.
   1. We can move things by pushing. Pages **32**, 33, 34, 35, 36-37, 38-39, 40.
   2. We can move things by pulling. Pages **32**, 33, 34, 36-37, 38-39, 40.

C. We can use machines that we operate with our own muscles.
   1. Machines are devices we use to help us do our work. Pages 29, **33**, 34, 35, 36-37, 38-39, 40.
   2. We can use less force to do work if we use a machine. Pages 29, **33**, 34, 35, 36-37, 38-39, 40.

D. We can move things with animals.
   1. We use the muscles of animals to save our energy. Pages 30-31, 32, **34**, 36-37, 38-39, 40.
   2. Many animals are stronger and can exert more force than man. Pages 30-31, 32, **34**, 36-37, 38-39, 40.
   3. Animals use their muscles to push and pull. Pages 30-31, **32**, 34, 36-37, 38-39, 40.

E. We can move things with machines that have engines and motors.
   1. Many motors and engines have greater power than human beings or animals. Pages 30-31, **35**, 36-37, 38-39, 40.
   2. Motors and engines supply energy to run machines. Pages 30-31, **35**, 36-37, 38-39, 40.
   3. Motors and engines must be started by man. Pages 30-31, **35**, 36-37, 38-39, 40.
   4. Motors and engines use electricity or fuel as sources of energy. Pages 30-31, **35**, 36-37, 38-39, 40.

UNIT III: Sun, Wind, and Weather

A. There are many kinds of weather.
   1. Sun, moisture, temperature, and wind are elements of weather. Pages **42-43**, 44, 45, 46, 47, 50-51, 52-53, 54, 55, 56-57, 58, 59, 60.
   2. Weather combinations vary. Pages **42-43**, 58, 59, 60.
   3. Weather changes may take place rapidly within a given day. Pages **42-43**, 54, 58, 59.
   4. Weather changes can often be predicted from the condition of the sky. Pages **42-43**, 58.

B. The sun appears to rise in the morning, describe an arc overhead, and set in the evening.
   1. The apparent movement of the sun divides our day into the common time intervals known as dawn, morning, noon, afternoon, evening, and night. Pages **44**, 45, 46.
   2. Shadows are different in length and direction at different times of the day. Pages **44**, 45, 46.
   3. The length and position of shadows can be used to tell approximate time. Pages **44**, 45, 46.

C. The sun gives us light and heat.
   1. When we receive no sunlight, it is night. Pages **44**, 47.
   2. The amount of light that we receive from the sun depends upon how high the sun is in the sky. Pages **44**, 45, 46.
   3. The amount of heat received from the sun varies with the time of year. Pages **50-51**, 52-53, 58, 59, 60.
   4. The amount of heat received from the sun varies with the time of day. Pages **46**, 47.
   5. During the daytime it is warmer in the direct sunlight than in the shade. Pages **47**, 49.
   6. When clouds come between us and the sun, some of the sun's light and heat is cut off. Pages **47**, 60.

D. Temperature is important in determining what the weather will be and in determining our daily activities.
   1. Temperature can be estimated; we use a thermometer to measure it exactly. Pages 46, 47, **48-49**, 50-51, 52-53, 58, 59, 60.

    a. When the liquid in the thermometer goes up, it is hotter. Pages **48-49**, 50-51, 52-53, 59.
    b. When the liquid in the thermometer goes down, it is colder. Pages **48-49**, 50-51, 52-53, 58, 59.
  2. Whether clouds bring rain or snow depends upon the temperature. Pages **58**, 59.
  3. Snow melts when the temperature rises sufficiently. Page **59**.
  4. Rain may freeze and cover the ground with ice when the temperature falls. Page **59**.
  5. We use a thermometer in our daily lives. Pages *50-51*, **52-53**.
  6. Changes in temperature affect human activities. Pages **46**, 50-51, 52-53.

E. The wind has force.
  1. The wind blows with varying degrees of force. Pages *54*, **55**, *56-57*, 60.
  2. The force of the wind may be told by the effects it produces. Pages *54*, **55**, *56-57*, 60.
  3. Man often uses wind force to his advantage. Pages *55*, **56-57**, 60.
  4. Wind may be man's enemy. Pages *54*, *55*, **56-57**, 60.

UNIT IV: Plants

A. Living things have certain characteristics that distinguish them from non-living things.
  1. All living things grow, reproduce, and die. Pages **62-63**.
  2. Plants are living things. Pages **62-63**.
  3. Animals are living things. Pages **62-63**.

B. Plants have distinguishing features by which we can tell one plant from another.
  1. The general shape of the flower, the number of petals, and their arrangement and shape are often distinguishing features. Pages **64**, 66-67, 71.
  2. The general shape of the leaves, their types of serration, and their rib arrangement are often distinguishing features. Pages **65**, 66-67, 71.
  3. The color and shape of the seeds and kind of seed container produced are often distinguishing features. Pages 68-69, 70, **71**, 72.

C. Plants grow and reproduce their kind.
  1. Most plants that we raise grow from seed. Pages **68-69**, 70, 71, 72, 73, 76-77.
  2. Plants follow a definite pattern and time in growing to maturity. Pages **68-69**, 70, 71, 73.
  3. Seeds are produced from the flowers. Pages **68-69**, 70, 71.
    a. Seed pods usually open when the seeds are ripe. Pages **68-69**, 70, 71, 72.
    b. Seeds produce the same kind of plant as the parent. Pages **68-69**, 70, 71, 73.
  4. Seeds are distributed in many natural ways. Pages *68-69*, *70*, *71*, **72**, *76-77*.
    a. Some seeds are heavy and merely fall to the ground. Pages *68-69*, **72**.
    b. Some seeds have fluff attached and float in the air. Pages *71*, **72**.
    c. Some seeds are contained in edible fruits and are distributed when man and animals eat the fruit. Pages *71*, **72**.
    d. Some seeds have stiff sails and ride in the wind. Page **72**.
    e. Some seeds have hooks and catch rides on moving objects. Pages **72**, *76-77*.

D. Sufficient water and light are necessary for growth.
  1. Seeds need water to germinate. Pages *68-69*, **73**, *76-77*.
  2. Plants die if they are deprived of water for too long a time. Pages **73**, 75.
  3. Green plants die if they are deprived of light for too long a time. Pages *68-69*, **74**, 75.

Q 163 B37 GR-2 TCH-ED-
BEAUCHAMP WILBUR LEE 1891-
CURRICULUM FOUNDATION SERIES

39415582 CURR HIST

000017967589

Date Due

Date Due

FEB 1 2	RETURN		
EDUC MAR 13			
MAY 6	RETURN		
FEB 21	RETURN		

EDUCATION

EDUCATION LIBRARY